OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

NOVEMBER 28, 1949
VOLUME 38, NO. 24

AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY · BLEACHING · DYEING · PRINTING · FINISHING

For dyed cotton yarns...

VAT COLORS

Vat colors yield the best over-all fastness properties available on cotton today. The Du Pont line includes Ponsol*—anthraquinone-type dyes—and Sulfanthrene*—thioindigoid and related dyes. They offer a wide range of shades with good penetration, uniformity and brilliance... are suitable for use in all kinds of mechanical dyeing equipment.

Let our Technical Staff work with you and help you turn out dye jobs which assure customer color-satisfaction. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Div., Wilmington 98, Del.

*REG. U. S. PAT. OFF.

Du Pont Dyestuffs

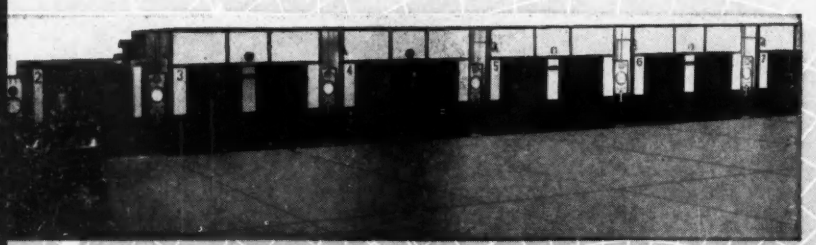
DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

science

takes the "guesswork" out of dye-making

Exclusive, made-to-order equipment throughout the dye manufacturing process serves to make an exact SCIENCE of Dye-making at Althouse. Rigid control of each and every step from crudes to finished products serves to carry out our original ideas and scientific advancements in producing new and uniform dyes.



The dryers, for instance, are all instrument-controlled to maintain uniformity of shades and properties.

ALTHOUSE
Chemical Company, Inc.
READING · PA.

pace-setter in precision dye-making

Presenting...

WOOL OILS by SWIFT

for more efficient fiber lubrication

To give producers of woolens and worsteds a wide selection, Swift & Company offers this full line of special purpose fiber lubricants:

GENERAL INFORMATION

Swift's Wool Oils tend to stay fixed to the wool where they are needed, rather than spreading to card clothing, aprons, etc. In many cases, they give greater lubrication per pound than conventional oils. They are carefully formulated to emulsify readily and come out easily during scouring operations.

All Swift's Oils (except NAWM specification oils) contain a penetrating agent which greatly aids in even wetting of wool by the emulsion.

PRODUCTS

The best recommendation for any of these oils is its performance under your own mill conditions. We suggest you try Swift's Oils to see for yourself if the characteristics described below do not hold true in your operations.

1 **70S—Very economical lubricant for wool fibers.** Formulated to produce loftier yarn. Treated to reduce oxidation. Contains base of high grade sulfonated animal oil to give adequate lubricating properties.

2 **1350S—High efficiency lubricant for wool and synthetic fibers.** 100% glyceride—contains no mineral oil. Intended to save on soap.

3 **350S—Lubricant specially formulated for synthetic fibers.** Ideal for synthetic staple. In testing, note how 350S forms stable emulsions with low percentages of water.

4 **50—For NAWM "Commission Combing."** Blended to the rigid specifications of the National Association of Wool Manufacturers.

5 **100**—Same as No. 50 Wool Oil with good quality red oil and triethanolamine added to promote rapid emulsification.

Swift's Lard Oil available treated to reduce rancidity

Many woolen mills specify pure Lard Oil or Grease Oil for fiber lubrication. Now you can order Swift's Lard Oil with either of two effective anti-oxidants added to retard oxidation, rancidity, gumminess and change of color.

A phone call or postal card will bring full information about any Swift Oil.

Order a trial drum at carload price.

Swift & Company

CHICAGO 9, ILLINOIS

AD 11-9

Please send me, at carload price, a 55 gallon trial drum of Swift's Wool Oil.

☐ 70S ☐ 1350S ☐ 350S ☐ 50 ☐ 100

I understand if not fully satisfied, I may return it for credit at your expense. *This offer expires January 27, 1950.*

*Name*_____ *Title*_____

*Firm Name*_____

*Address*_____

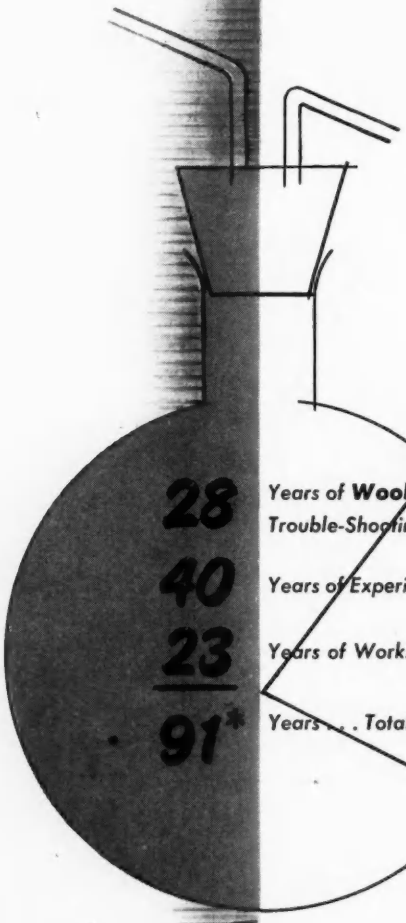
(Street & No.) *(City or Town)* *(Zone)* *(State)*

—Got a Textile Chemical Problem?

91*

YEARS say—

"MAYBE we have the answer!"



28 Years of **Woolen** and **Worsted** Trouble-Shooting!

40 Years of Experience with **Silks** and **Rayons!**

23 Years of Working with **Cotton!**

91* Years . . . Total experience of our experts!

There is only one real test for any service . . . that's a fair trial! Give us this test with your next textile chemical problem, large or small . . . We'll rest our case on our answers!

ATLANTIC CHEMICAL CO., INC.
CENTREDALE, RHODE ISLAND
Exclusive Eastern Distributors of
Reichhold Fabrez Synthetic Resins

RCI — Use ATCO Products

American Dyestuff Reporter, Vol. 38, No. 24, November 28, 1949. Published every other Monday. Copyright 1949, by Howes Publishing Co., Inc., One Madison Ave., New York 10, N. Y. Domestic subscription, $5.00; Canadian, $6.00. Foreign, $10.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the act of March 3, 1879.

REFINED PRODUCTS CORPORATION

THIS EFFICIENT WOOL OIL SCOURS EASILY *Even after aging in the cloth!*

Proxol, the amazingly efficient, free-scouring wool oil, is a "tonic" for any woolen system. In addition to its excellent scouring properties, Proxol has these 10 big advantages:

1 Self-emulsifying — at any concentration.

2 Quick spreading properties — extremely small particle size.

3 Anti-static.

4 Non-corrosive.

5 Minimum residual oil content.

6 Helps assure uniform yarn and cloth.

7 Increases spinning efficiency — minimizes fiber breakage . . . fewer ends down.

8 Excellent aging characteristics — no odor or discoloration.

9 Reduces fly or waste.

10 Won't gum up card clothing . . . stripping is reduced.

PROCTER & GAMBLE

PROXOL

MADE IN U.S.A.

When scoured wool is atomized or sprayed with Proxol, you can count on trouble-free carding and spinning. It will pay you to try Proxol.

Procter & Gamble **CINCINNATI, OHIO**

Makers of* OLATE FLAKES, *the universal low titer textile soap.

AMANTHRENE* VAT COLORS
provide the answer to the demand for
better color fastness in textiles

Amanthrene

PINK FF

in paste and
double powder form

A vat pink of distinction.
Its delicate brilliant shade tone is that
of fastidious ARISTOCRACY.

Without a peer for the printing of fine cotton
and rayon dress goods and draperies as a self color or
in combination. Equally suitable for dyeing the
same fibres. Offering the particular advantages of
both smooth paste and fine powder.

Another of the Amanthrene range of superior vat colors.
For detailed information on the whole range available, as well as
data regarding your own particular requirements,
consult our nearest branch. A.A.P. technicians are always
happy to be of service.

AMERICAN ANILINE PRODUCTS, INC., 50 Union Square, New York, N. Y. • ***Plant:*** Lock Haven, Pa.
Branches: Boston, Mass. • Providence, R. I. • Philadelphia, Pa. • Charlotte, N. C. • Chicago, Ill. • Los Angeles, Cal.
Chattanooga, Tenn. • **Dominion Anilines & Chemicals Ltd.** • Toronto, Canada • Montreal, Canada

*Reg. U. S. Pat. Off.

NO MORE *TIPPY* WOOL

with

ANTHOMINE*

on the job!

IN ALL WOOL DYEING OPERATIONS *ANTHOMINE* INCREASES THE AFFINITY OF WOOL FIBRES FOR DYESTUFFS.

THIS RESULTS IN LEVEL SHADES WHEN DYEING STOCK, YARN OR PIECE GOODS.

TIPPY AND BLENDED WOOLS ARE DYED A SOLID SHADE BY ADDING *ANTHOMINE* TO THE DYE BATH.

Mills throughout the country use* ANTHOMINE *for:

- **Even dyeing**
- **Brighter, fuller shades**
- **Quicker, better exhaustion of dyebath**
- **Softer, more pleasing "hand"**
- **Reduced processing time**

Send for Technical Service Bulletin #203-100.2 for complete information, including how to use ANTHOMINE for Top and Yarn Dyeing, Pressure or Package Dyeing, Leveling Unevenly Dyed Yarn or Shady Pieces, Dyeing Metallized Colors, etc.

Arkansas Co. INC.

Manufacturers of Industrial Chemicals for Over 40 Years

NEWARK, NEW JERSEY

*Reg. U.S. Pat. Off.

INDANTHRENES

famous for quality

Brilliant colors . . . fast to light, laundering, chlorine and wear.

No other class of dyestuffs has the brilliance of shade and the range of colors combined with the unsurpassed fastness properties of Indanthrenes.

GENERAL DYESTUFF CORPORATION

435 HUDSON STREET, NEW YORK 14, NEW YORK

BOSTON • PHILADELPHIA • CHARLOTTE • PROVIDENCE • CHICAGO • SAN FRANCISCO

IRON FREE—RAPID SOLUBILITY

Prove High Quality of Hooker Sulfides

Where you are using or considering using Sodium Sulfide or Sodium Sulfhydrate, you will do well to see how the high purity of these Hooker products can make your work easier and more effective.

Hooker Sodium Sulfide has a maximum iron content of 8 ppm and Sodium Sulfhydrate a maximum iron content of only 5 ppm. In developing these iron free sulfides, Hooker has also been able to keep them remarkably free from other impurities.

Rapid and complete solubility of these sulfides, a result of careful manufacture and high purity means that the clean solution can be used without settling or decanting—a time and material saving that is well worth while.

Large users of sodium sulfhydrate can obtain this Hooker product in liquid form in tank car quantities. It is supplied in concentrations of 37% or 45%.

Send for samples and Technical Data Sheets. Please make your request on your company letterhead.

SODIUM SULFIDE Na_2S

Mol. Wt. 78.1
M.P. .....100°C

Light buff colored solid in flake form. Rapidly soluble in water; slightly soluble in alcohol; insoluble in ether.

ANALYSIS

Na_2S ..... 60 to 62%
NaCl .....1.5% Max.
Other Na Salts ..... 2.0% Max.
Fe .....8 ppm Max.
Cu, Ni, Cr, Mn, Pb ..1 ppm Max.
Water of crystallization
36.5 to 34.5%

USES

In unhairing hides and wool pulling; desulfurizing viscose rayon; in manufacture of dyestuffs, chemical intermediates, paper pulp, soap and rubber, as an ingredient of dye liquor for textile dyeing; boiling out linen; ore flotation and metal refining.

SHIPPING CONTAINERS

Steel drums ..90 and 350 lbs. net

SODIUM SULFHYDRATE NaSH
(sodium hydrosulfide)

Mol. Wt. 56.1
M.P. .....55°C

Light lemon colored solid in flake form. Completely and rapidly soluble in water, alcohol and ether.

ANALYSIS

NaSH .....70 to 72%
Na_2S .....2.5% Max.
NaCl .....0.8% Max.
Na_2SO_3 and $NaHCO_3$ ..0.4% Max.
Fe .....5 ppm Max.
Cu, Ni, Cr, Mn, Pb ...1 ppm Max.
Water of crystallization ..28 to 26%

USES

In unhairing hides, in desulfurizing viscose rayon; in preparation of dyestuffs and other organic chemicals such as thioamides, thiourea, thioglycolic acid, thio- and dithiobenzoic acids, sodium thiosulfate.

SHIPPING CONTAINERS

Flake: Lacquer-lined steel drums, 90, 350 lbs. net
Liquid .....Tank Cars

HOOKER RESEARCH PRESENTS

SULFUR COMPOUNDS

Bulletin No. 9

Looking for a new organic sulfur compound? The answer to your problem may be found in this new Hooker bulletin. It lists typical processes and over 40 different organic sulfur compounds in 9 different classifications. These products are not all being manufactured, but they are all products we know how to make. As they are all typical products, they may suggest other materials of a similar type for which you may be looking.

Hooker does not offer ordinary sulfonations or sulfurized products. We do offer a variety of sulfides, mercaptans, thio acids, thiocyanates and other sulfur derivatives, many of which require our specialized processing ability.

If you have a potential requirement for a new organic sulfur compound, see what we can do for you. Write today on your business letterhead for your copy of Bulletin No. 9, Sulfur Compounds.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

HOOKER CHEMICALS

9-1448

2 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
NEW YORK, N. Y. • WILMINGTON, CALIF. • TACOMA, WASH.

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

The ONYXSANS for CATIONIC SOFTENING

DATA FOR FILING **NOVEMBER, 1949**

GENERAL DATA

The Onyxsans are complex amido derivatives, cationic in action, designed to provide a wide range of durable softening effects as a result of substantive action on textile fibers. Surface lubrication with various oils or with anion-active materials does not give any substantive effect.

With the "tailored" Onyxsan molecules, good penetration into the fibers is assured, plus uniform application. Durability of hands results from an actual combination of the cations of the Onyxsans with the textile fibers. Actually, on acetate, bemberg, viscose and cotton fibers, Onyxsan softening is permanent, lasting for the life of the textile. On other fibers the effect is not permanent, but it is satisfactorily durable.

Where Onyxsans Apply

Cationic softening with an Onyxsan imparts smoothness and drape to many fabrics which are normally rough, coarse and non-responsive to treatment by other methods.

A very small quantity of the right Onyxsan or combinations of Onyxsans can, with variations in concentration and treatment method, produce a wide range of hands, from waxy, semi-hard to soft drapability. There is no matting or plastering down of goods when Onyxsans are used.

Stability

Onyxsans do not separate on standing. They can be stored indefinitely without alteration of properties. Boiling Onyxsan solutions will not cause them to separate or deteriorate.

Uniformity

Onyxsans are 100% synthetic products made from raw materials of a consistently high degree of quality, obtained from constant sources of supply. The manufacturing process is standardized and under rigid control.

The Onyxsan Family

The selection of any Onyxsan for a specific type of finish depends on the individual mill conditions and the nature of the textile to be treated. See Technical Bulletin TX-1 for complete details.

Onyxsan S-50

Onyxsan S-50 is used on cotton, viscose, bemberg and acetate textiles, when soft, drapable hands are required. It is an excellent finish for two-ply alpaca, cynara, romaine and other rayon piece goods, multi-filament rayon and acetate underwear cloth, rayon pile fabrics and taffetas, bemberg sheers, etc.

Drapery cloths treated with Onyxsan S-50 pick up less dirt and dust than those finished with ordinary softeners. Cotton fabrics of all kinds, including broadcloths and percales, are given a soft hand and draping qualities not usually obtained in cotton goods. S-50 helps remove harshness from all types of cotton knit and woolen goods. One of the large applications of Onyxsan S-50 is the finishing of candlewick spreads in cotton or cotton-rayon constructions.

Onyxsan S

Onyxsan S is the concentrated form of Onyxsan S-50. Onyxsan S is a good investment for S-50 users who wish to save storage space and shipping costs, or who make up stock solutions in large volume.

Onyxsan LG

Onyxsan LG is similar to S-50 but has the added quality of imparting mellow or soft, lofty hands to cotton, viscose and acetate fabrics. It is excellent for Aralacs, silk, wool and mixtures of these fibers, giving pliable hands of good durability.

Onyxsan AD

Onyxsan AD finds its major use in softening delicately colored textiles without changing colors. Onyxsan AD not only maintains the close tolerances allowed for these delicate shades, but gives the same wide range of hands as any other Onyxsan.

Onyxsan HSB

Onyxsan HSB gives a firm smooth waxy hand to fabrics. It is widely used in finishing delicately tinted goods where rigid color control is vital. Because of its minimum yellowing effect, Onyxsan HSB is more adaptable to whites than any other member of the Onyxsan family.

Treated Goods do not Deteriorate

Onyxsan treated goods do not become rancid in storage or develop odors. Mark-off signs do not appear, nor do the fabrics become stiff.

Compatibility

The Onyxsans are compatible with hard water, chlorides, sulfates, alkalies, organic acids and small amounts of mineral acids; they are compatible with anionic surface-active chemicals. Spot reactions between Onyxsans and incompatible substances may be readily avoided by thorough rinsing of the fabric before applying the Onyxsan.

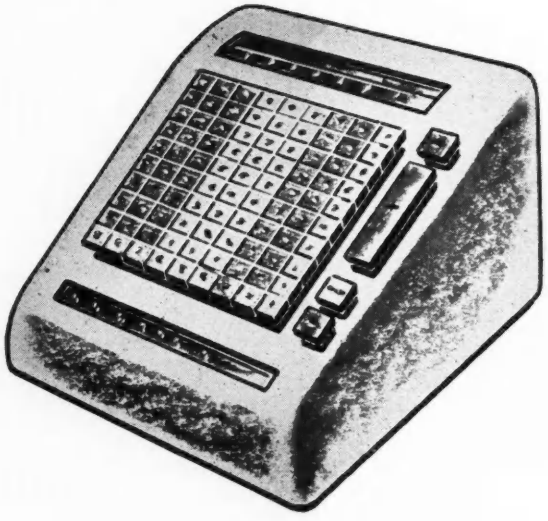
Ease of Application

Onyxsans are easy to apply—require no change in equipment or operation. No separate bath is necessary. They are used in the print washer, jig, dye beck and starch mangle as well as in 2-and 3-roll quetsches.

onyx
CHEMICALS FOR DYEING • FINISHING • PRINTING
ONYX OIL & CHEMICAL COMPANY
JERSEY CITY 2, N. J.
CHICAGO • BOSTON • CHARLOTTE • ATLANTA
In Canada: Onyx Oil & Chemical Co., Ltd. Montreal, Toronto, St. Johns, Que.
For Export: Onyx International Jersey City 2, N. J.

FOR YOUR INFOR M ATION

where to test a SIZING AGENT



STYMER for acetate warps

You *can* test your chemicals on a calculating machine! Stymer, for example, subtracts costs and adds profits all along your production line:

You save because Stymer goes farther than natural sizes. A pound sizes *more* yards.

You save because Stymer doesn't gell. No more costly man hours cleaning pipes, valves and size boxes!

You save because Stymer won't set when cold, and can be left in size boxes overnight.

You save time and money cleaning and recovering cans.

You save in weaving because Stymer sized warps show little or no shedding, maintain yarn twist, and have fewer end breaks.

You save in operating time and expense, because Stymer washes out easily—sometimes cuts washing time in half.

With all these factors, no wonder more and more mills are coming out best in dollars, with Stymer. Your mill, too, can economize with Stymer size. For a sample, for full technical information, or for help with Stymer at your mill, just send the handy coupon.

Stymer: Reg. U. S. Pat. Off.

Stymer's Production Advantages
Stymer forms a tough, smooth film. It gives warp a superior finish over a wide range of humidities and temperatures. It reduces static electricity. It is non-gumming, non-thickening, non-mildewing. Stymer will not set or sour. Its detergent power helps remove dirt picked up during weaving.

• MANY OF THE LARGEST FINISHERS
• WITH THE LARGEST RESEARCH STAFFS
• ARE USING MORE AND MORE CATALYST AC

Best compliment you can pay a product is to buy it, use it, and then *re-order* it. That's the kind of compliment we've been getting on Catalyst AC from some of the largest cotton and rayon finishers in the country. These are the mills with the research staffs and laboratories to make sure the product is right. These are the mills with the cost-control systems to make sure that their processes are *economical*. And these mills . . . with their highly qualified experts on textile processing chemicals ...are proving Catalyst AC by their orders and re-orders.

Catalyst for Cost Cutting: Important operating economies can be made with Catalyst AC, especially by mills on shifts. That's because Catalyst AC reacts faster when you want it fast (in the curing oven) and slower when you want it slow (in the bath). It will not cause polymerization in the bath for 24 to 48 hours. The result is that you save refrigeration costs common with diammonium phosphate; and you get a product that's easier and cheaper to handle on overnight shutdowns.

Greater Resin Retention after Washing: Your melamine or urea finish stays on the fabric longer with Catalyst AC, as shown in the resin retention table on the left-hand page. Better washfastness in a cotton or rayon finish is a *consumer* advantage which is reflected quickly in *mill* sales.

FOR UREA AND MELAMINE FINISHES

Cotton and rayon mills find Catalyst AC effective on both melamine and urea finishes. If your mill uses urea finishes for crush resistance, fabric stability or shrinkage control on cottons or rayons, you'll find that Catalyst AC can lower your processing costs...raise your efficiency, and give you a higher-quality fabric.

Send the coupon for full information.

SERVING INDUSTRY . . .
WHICH SERVES MANKIND

MONSANTO
CHEMICALS — PLASTICS

MONSANTO CHEMICAL COMPANY
Textile Chemicals Dept., Desk ADT 26
Everett Station, Boston 49, Mass.

Please send full technical information on: ☐ *Catalyst A.C.* ☐ *Stymer*

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

Rx FOR THE BLUES

for Navy Blues

PHARMASOLS*

Blue G
Blue GB

for Bright Blues

INDIGOSOL*

Blue IBC

*Reg. U.S. Pat. Off.

These azoic colors, for printing cotton, linen or rayon, produce Navy Blue of good fastness at a low cost. In combination with the Pharmasol Yellows they produce deep Browns.

Pharmasols are stabilized solutions, adjusted to the most practical concentration, which can be easily applied with a maximum of efficiency.

Pharmasols do not decompose and thereby overcome the problems of troublesome dissolving.

The outstanding soluble vat color for producing bright Blues in any depth, of excellent fastness, is Indigosol Blue IBC. It is suitable for dyeing, padding and printing on cotton, linen or rayon (excepting acetate fibers) where maximum fastness is required.

Indigosol Blue IBC is an important member of the group of very fast Indigosols, all of which are readily soluble and easily developed.

Write For Complete Information!

CARBIC COLOR & CHEMICAL CO., INC.

451-453 Washington Street — New York 13, N. Y.

BRANCHES: Philadelphia, Pa. • Providence, R. I. • Charlotte, N. C. • Hamilton, Ont.

Importers of the Manufactures of Durand & Huguenin S.A. Basle, Switzerland

Representatives: Los Angeles (Hathaway Allied Products)

Exclusive Distributors of: Pharmasols, Pharmols, Pharmacines

AMERICAN

DYESTUFF REPORTER

Incorporating Textile Colorist and Converter

NORMAN A. JOHNSON, B.T.C.
Editor

CHARLES A. WHITEHEAD
Managing Editor

MYRON D. REESER
Advertising Manager

HERBERT A. STAUDERMAN
Advertising Representative

GRACE B. BURTON
Production Manager

M. H. MORGAN
Circulation Manager

Official Publication of the Proceedings of the American Association of Textile Chemists and Colorists

•

Published every other Monday by the **HOWES PUBLISHING COMPANY, INC.,** One Madison Avenue, New York 10, N. Y. **C. R. Howes,** President; **Harry F. Crawford,** Executive Vice-President; **Norman A. Johnson,** Vice-President; **Ernest J. Finan,** Treasurer; **Myron D. Reeser,** Secretary; **C. Essenbreis,** Assistant Secretary.

•

Also Publishers of
HOSIERY INDUSTRY WEEKLY
HOSIERY MERCHANDISING

•

NOVEMBER 28, 1949
VOLUME 38 NUMBER 24

Contents

Contents of previous issues can be found by consulting the Industrial Arts Index and the Engineering Index, Inc. at your library

• Departments

Trade Notes—New Products..... 869

Book Review 876

• Proceedings of the American Association of Textile Chemists and Colorists

Intersectional Contest:
Acid Colloids of Resins.....P842
Rhode Island Section

Calendar P852

Auxiliaries and Testing Group:
Static in Textile Processing.....P853
D. J. Lehmicke

New York Section:
The Chemistry of Commercial Plastics.....P856
Reginald L. Wakeman

Treasurer's Report P861

Auditor's Report P862

Annual Banquet Session:
Freedom in Action.....P863
Morris Sayre

Report of Pacific Northwest Section Meeting.....P865

October Meeting, Rhode Island Section.....P865

Report of Hudson-Mohawk Section.....P865

WNE Section to Meet December 9th.....P865

One Hundred and Sixty-Ninth Council Meeting...P866

Employment Register P867

Copyright, 1949, Howes Publishing Co., Inc.

for new COLOR effects to stimulate your sales

National Aniline Dyes

NATIONAL ANILINE DIVISION • ALLIED CHEMICAL & DYE CORPORATION

40 RECTOR STREET, NEW YORK 6, N.Y.

BOSTON • PROVIDENCE • PHILADELPHIA • CHICAGO • SAN FRANCISCO • PORTLAND, ORE.
GREENSBORO • CHARLOTTE • ATLANTA • NEW ORLEANS • CHATTANOOGA • TORONTO

Proceedings of the
American Association of Textile Chemists and Colorists

Copyright, 1949, American Association of Textile Chemists and Colorists

November 28, 1949

National Officers of the Association

President
HENRY F. HERRMANN
General Dyestuff Corp.,
435 Hudson Street, New York 14, N. Y.

Vice-Presidents
C. NORRIS RABOLD
The Erwin Cotton Mills Co.
Cooleemee, North Carolina
JOHN N. DALTON
Pacific Mills, Lawrence, Massachusetts

Treasurer
WILLIAM R. MOORHOUSE
National Aniline Division, Allied Chemical & Dye Corp., 150 Causeway Street, Boston 14, Massachusetts

Secretary
HAROLD C. CHAPIN
Lowell Textile Institute, Lowell, Massachusetts

Founder
LOUIS A. OLNEY
(Deceased)

Chairman of the Research Committee
J. ROBERT BONNAR
General Dyestuff Corp.,
435 Hudson Street, New York 14, N. Y.

Director of Research
HAROLD W. STIEGLER
Lowell Textile Institute, Lowell, Massachusetts

Councilors

Representing Sections

Rhode Island: GEORGE H. WOOD, JR., RAYMOND W. JACOBY, RALPH F. CULVER
Philadelphia: ONSLOW B. HAGER, M. H. KLEIN, FREDERICK W. TRAUT, LLOYD O. KOONS, WALTER F. FANCOURT, 3rd.
New York: WINN W. CHASE, WILLIAM A. HOLST, JR., FRANCIS S. RICHARDSON, CHARLES W. DORN, HERMAN E. HAGER, HERMAN E. WILDE.
Northern New England: KENNETH R. FOX, GEORGE O. LINBERG, C. WENDALL LEVER.
Piedmont: JOHN B. NEELY, WYSS L. BARKER, LELAND G. ATKINS.
Southeastern: A. KEMPTON HAYNES, WALTER M. SCOTT.
South Central: JACK ANDERSON.
Mid-West: ELMER F. SMITH, GORDON M. MARKLE.
Western New England: HAROLD H. TAYLOR.
Pacific Southwest: FRANK P. BRENNAN.
Hudson-Mohawk: ALBERT E. HERRMANN, JR.
Pacific Northwest: CHARLES K. BISHOP.

Past Presidents

ELVIN H. KILLHEFFER, P. J. WOOD, WILLIAM H. CADY, ALBAN EAVENSON, CARL Z. DRAVES, THOMAS R. SMITH, WILLIAM D. APPEL.

Standing Committees of the Council and their Chairmen

Executive Committee on Research
J. ROBERT BONNAR, *Chairman*

Publicity
PAUL J. LUCK, *Chairman*

Conventions
KENNETH H. BARNARD, *Chairman*

Appropriations
WILLIAM R. MOORHOUSE, *Chairman*

Constitution and Bylaws
HAROLD C. CHAPIN, *Chairman*

Membership and Local Sections
JOHN N. DALTON, *Chairman*

Corporate Membership
LEONARD S. LITTLE, *Chairman*

Publications
PERCIVAL THEEL, *Chairman*

Technical Programs
ARTHUR W. ETCHELLS, *Chairman*

Local Sections and their Officers

Northern New England Section

Chairman
FRANK J. O'NEIL
Pacific Mills
Lawrence, Massachusetts

Secretary
AZEL W. MACK
Dexter Chemical Corp., 581 Boylston St., Boston 16, Massachusetts

Vice-Chairman — RALPH E. HALE
Treasurer — MARTIN H. GURLEY, JR.

Rhode Island Section

Chairman
ROBERT W. JOERGER
Franklin Process Co., 546 Eddy St., Providence, Rhode Island

Secretary
EMORY A. RICHARDS
Airedale Worsted Mills, Inc., 1 Main Street, Woonsocket, Rhode Island

Vice-Chairman — ELLIOT BROADBENT
Treasurer — ROBERT R. FARWELL

New York Section

Chairman
CHARLES W. DORN
J. C. Penney Co., 330 West 34th Street, New York 1, N. Y.

Secretary
NORMAN A. JOHNSON
American Dyestuff Reporter, One Madison Ave., New York 10, N. Y

Vice-Chairman — PAUL J. LUCK
Treasurer — JOHN H. HENNESSEY

Philadelphia Section

Chairman
JAMES DIXON
Calco Chemical Division, American Cyanamid Co., 401 N. Broad Street, Philadelphia, Pennsylvania

Secretary
THOMAS H. HART
Hart Products Corp., P. O. Box 5020
Philadelphia 11, Pennsylvania

Vice-Chairman — RICHARD B. STEHLE
Treasurer — A. E. RAIMO

Piedmont Section

Chairman
PELHAM EUGENE SMITH
Riegel Textile Corp.,
Ware Shoals, South Carolina

Secretary
EDWIN A. BRIGGS
Southern Franklin Process Co.,
Greenville, South Carolina

Vice-Chairman — ROBERT H. SMITH
Treasurer — R. HOBART SOUTHER

South Central Section

Chairman
WILBUR K. NEWMAN
Peerless Woolen Mills, Rossville, Georgia

Secretary
HOWARD P. LOVELESS
Crystal Springs Bleachery, Chickamauga, Georgia

Vice-Chairman — JOSEPH H. O'NEILL
Treasurer — CHARLES GORDON

Mid-West Section

Chairman
ELLIOTT MORRILL
Rit Products Corp., 1437 W. Morris St.
Indianapolis, Ind.

Secretary
JOHN SCHRODER
General Dyestuff Corp., 731 Plymouth St.
Chicago 5, Ill.

Vice-Chairman — LEONARD J. ARMSTRONG
Treasurer — TOM LATHAM

Southeastern Section

Chairman
C. RUSSELL GILL
Southern Sizing Co., P. O. Box 167
Atlanta, Georgia

Secretary
S. JACK DAVIS
Callaway Mills, LaGrange, Georgia

Vice-Chairman — HOWARD M. WADDLE
Treasurer — ADAM FISHER, JR.

Western New England Section

Chairman
J. EDWARD LYNN
American Cyanamid Company
Stamford, Connecticut

Secretary
EDWARD A. MURRAY
Deering Milliken Research Trust,
Stamford, Connecticut

Vice-Chairman — RAYMOND J. CAREY
Treasurer — ROBERT N. BROWNLEE

Pacific Southwest Section

Chairman
H. A. DES MARAIS
General Dyestuff Corp., 37 Clementina St.
San Francisco 5, California

Secretary
FREDERICK L. WILHELM
American Aniline Products, Inc.
2313 East Eighth St., Los Angeles 21, California

Vice-Chairman — RUSSELL B. COLEMAN
Treasurer — CHARLES H. DUNKER

Hudson-Mohawk Section

Chairman
JACK EPELBERG
Cluett, Peabody & Co., 117th St. at 7th Ave.,
North Troy, New York

Secretary
WILLIAM A. NELSON
Ritter Chemical Company, Inc., 403 W. Main St.,
Amsterdam, New York

Vice-Chairman — DAVID O. HAMER, JR.
Treasurer — IRWIN J. SMITH

Pacific Northwest Section

Chairman
EARL B. BREARLEY
Jantzen Knitting Mills, 411 N.E. 19th Ave.
Portland 14, Ore.

Secretary
ROBERT M. TRUE
General Dyestuff Corp., 1102 Terminal Sales Bldg.
Portland 5, Ore.

Vice Chairman — OTTO E. SCHMIDT
Treasurer — WILLIAM C. MARSHALL

STUDENT CHAPTERS: LOWELL TEXTILE INSTITUTE, NORTH CAROLINA STATE COLLEGE, PHILADELPHIA TEXTILE INSTITUTE, NEW BEDFORD TEXTILE INSTITUTE, GEORGIA SCHOOL OF TECHNOLOGY, CLEMSON COLLEGE, BRADFORD DURFEE TECHNICAL INSTITUTE, UTICA TECHNICAL INSTITUTE.

Intersectional Contest — (First Prize Winner)

ACID COLLOIDS OF RESINS

Presented by the

RHODE ISLAND SECTION

Committee

Alden D. Nute, *Chairman and Speaker*
Louis B. Cook
William J. Crawford
George M. Gantz
Andrew J. McNulty
W. George Parks
Raymond A. Pingree
Emory A. Richards
James C. Shore
Leonard A. Stanley
Fred R. Tripp
George H. Wood, Jr.

Introduction

THE finishing processes for textile materials require numerous chemical reactions mainly classified as colloidal in character. The term colloidal is used to define a state of matter, not a kind of matter. An arbitrary definition of the colloidal state is based on particle size. The range usually accepted is 10^{-7} to 10^{-4} cms. Alexander *(2)* defines a colloid as essentially a chemical substance in a labile or metastable state. The general tendency is for the interrupted aggregation processes to reestablish themselves if given an opportunity and sufficient time.

This present investigation was undertaken to study the application of acid colloids of various resins to textile materials. The acid colloid was formed by adding various concentrations of a given acid to the resin in aqueous solution at 70°F. The concentration of the resin was also varied over a considerable range. It was not possible to prepare an acid colloid of all the resins investigated under all concentrations as shown in the tables. These acid colloids are essentially of the lyophilic type where the solvent has an attraction for the colloidal particle.

The use of synthetic resins for finishing textile materials has become increasingly important over the past several years. *(2-6)* In this application, resins may be classified broadly into two groups: thermosetting and thermoplastic. The thermosetting resins are usually employed as water soluble monomers, the most important being urea-formaldehyde and melamine-formaldehyde. The thermoplastic resins are employed as aqueous emulsions or dispersions and a wide variety of chemical types have been found useful.

The thermosetting and thermoplastic resins have very different effects when applied to textile fabrics. Crease resistance and shrinkage control are the characteristic features obtained by the use of thermosetting urea or melamine-formaldehyde resins. Fabrics treated with thermoplastic resin emulsions are characterized by having increased weight or stiffness.

In attempting to classify the acid colloid resins, it is apparent that they must be considered thermosetting. A heat treatment or "curing" is required to in-

TABLE I

Preparation of Acid Colloid of Resin Aerotex M-3 at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	12.5	7.5	80.0	Satisfactory colloid
	10.0	7.5	82.5	Satisfactory colloid
	7.5	7.5	85.0	No colloid formed
	4.0	7.5	88.5	No colloid formed
	12.5	10.0	77.5	Satisfactory colloid
	12.5	5.0	82.5	Unsatisfactory colloid, milky
Formic, 90%	12.5	7.5	80.0	Satisfactory colloid
	10.0	7.5	82.5	No colloid formed
	7.5	7.5	85.0	No colloid formed
	5.0	7.5	87.5	No colloid formed
	4.0	7.5	88.5	No colloid formed
	12.5	10.0	77.5	Satisfactory colloid
	12.5	5.0	82.5	Satisfactory colloid
Lactic, 85%	12.5	7.5	80.0	Satisfactory colloid
	10.0	7.5	82.5	No colloid formed
	7.5	7.5	85.0	No colloid formed
	5.0	7.5	87.5	No colloid formed
	4.0	7.5	88.5	No colloid formed
	12.5	10.0	77.5	Satisfactory colloid
	12.5	5.0	82.5	Satisfactory colloid
Glycollic, 70%	10.0	7.5	82.5	Satisfactory colloid
	5.0	7.5	87.5	Satisfactory colloid
d-Gluconic, 50% ...	12.4	24.0	63.6	Satisfactory colloid

NOTE 1—Succinic, Citric, Crotonic, Oxalic, Hydrochloric and Phosphoric acids were investigated using various concentrations of acid and resin. In all experiments either a clear solution or a white precipitate was formed, no colloid. The stability of the colloid when formed was decreased when the temperature was lowered to 40°F. A blue gel usually formed in several hours which was non-reversible.

TABLE II

Preparation of Acid Colloid of Resin Aerotex 605 at 200°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	12.50	7.25	80.25	Unsatisfactory—white precipitate
	10.80	7.20	82.00	Satisfactory colloid
	9.20	7.50	83.30	Satisfactory colloid
	7.50	7.60	84.90	Unsatisfactory colloid
	9.30	6.50	84.50	Unsatisfactory colloid
	9.00	7.00	84.00	Satisfactory colloid
Formic, 90%	12.50	7.25	80.25	Satisfactory colloid
	10.80	7.20	82.00	Satisfactory colloid
	9.20	7.50	83.30	Unsatisfactory—faint colloid
	7.50	7.60	84.90	No colloid formed
	10.00	9.40	80.60	Satisfactory colloid
Lactic, 85%	12.50	7.25	80.25	Satisfactory colloid
	10.80	7.20	82.00	Satisfactory colloid
	9.20	7.50	82.30	Unsatisfactory—faint colloid
	7.50	7.60	84.90	Unsatisfactory—faint colloid
Gluconic, 50%	10.0	15.0	75.0	Unsatisfactory—precipitate
Glycollic, 70%	10.0	10.7	79.3	Satisfactory colloid

See Note Table I.

* Presented in Intersectional Contest, Atlantic City Convention, October 14, 1949.

TABLE III

Preparation of Acid Colloid of Resin Aerotex UM at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	12.50	7.25	80.25	No colloid formed—precipitate
	10.00	7.25	82.75	No colloid formed—precipitate
	7.50	7.25	85.25	Gel formed
	4.00	7.25	88.75	Satisfactory colloid
	12.50	10.00	77.50	Gel formed
	12.50	5.00	82.50	Gel formed
Formic, 90%	12.50	7.25	80.25	Gel formed
	10.00	7.25	82.75	Gel formed
	7.50	7.25	85.25	Satisfactory colloid
	4.00	7.25	88.75	Satisfactory colloid
	12.50	10.00	77.50	Gel formed
	12.50	5.00	82.50	Gel formed
Lactic, 85%	12.50	7.25	80.25	Gel formed
	10.00	7.25	82.75	Gel formed
	7.50	7.25	82.75	Satisfactory colloid
	4.00	7.25	88.75	Satisfactory colloid
	12.50	10.00	77.50	Gel formed
	12.50	5.00	82.50	Gel formed

See Note Table I and add Gluconic and Glycollic to the acids that precipitated.
Aerotex 801—No colloid formed under the experimental conditions investigated.

TABLE IV

Preparation of Acid Colloid of Methylol Urea Paste at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	10.0	12.5	77.5	No colloid formed—white precipitate obtained in all experiments.
	7.5	12.5	80.0	
	4.0	12.5	83.5	
	10.0	20.0	70.0	
	7.5	20.0	72.5	
	4.0	20.0	76.0	
	10.0	5.0	85.0	
	7.5	5.0	87.5	
	4.0	5.0	91.0	

NOTE 1. Formic acid, 90%; Lactic acid, 85%; Succinic, Citric and Crotonic acids were investigated using the same formulations as given for Acetic acid. No stable colloids were formed.
NOTE 2. The experiments were repeated at 200°F. No stable colloids formed.
NOTE 3. The acid was added to the resin-water solution and the resin was added to the acid-water solution. No stable colloids formed.

TABLE V

Preparation of Acid Colloid of Ethylene Glycol Ether of Dimethylol Urea at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	10.0	12.5	77.5	No colloids formed
	7.5	12.5	80.0	
	4.0	12.5	83.5	
	10.0	20.0	70.0	
	7.5	20.0	72.5	
	4.0	20.0	76.0	
	10.0	5.0	85.0	
	7.5	5.0	87.5	
	4.0	5.0	91.0	

Formic acid, 90%; Lactic acid, 85%, Succinic, Citric and Crotonic acids were investigated using the same formulations as given for acetic acid. No stable colloids were formed.
See Note 2, Table IV.
See Note 3, Table IV.

TABLE VI

Preparation of Acid Colloid of Resin Resloom HP at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	10.0	7.5	82.5	Gel formed—no colloid
	7.5	7.5	85.0	Gel formed—no colloid
	4.0	7.5	88.5	Slight colloid—unsatisfactory
	10.0	10.0	80.0	No colloid formed—white precipitation
	[illegible]	[illegible]	85.0	No colloid formed—white precipitation
Formic, 90%	10.0	[illegible]	82.5	Gel formed—no colloid
	7.5	7.5	85.0	Satisfactory colloid formed
	4.0	7.5	88.5	Slight colloid—unsatisfactory
	10.0	12.5	77.5	Satisfactory colloid formed
	10.0	10.0	80.5	Gel formed—no colloid
	10.0	5.0	85.0	Gel formed—no colloid
Lactic, 85%	10.0	7.5	82.5	Gel formed—no colloid
	7.5	7.5	85.0	Satisfactory colloid formed
	4.0	7.5	88.5	Slight colloid—unsatisfactory
	10.0	10.0	80.0	Satisfactory colloid formed
	10.0	8.5	81.5	Gel formed—no colloid
	10.0	5.0	85.0	Gel formed—no colloid

NOTE 1. Succinic, Citric and Crotonic acids were investigated. In all experiments no colloid was formed because precipitation occurred.

sure fixation of the resin on a fabric. On the other hand, the acid colloid resins are similar to resin emulsions, since they are colloidal aggregates dispersed in water. As will be shown later, fabrics treated with acid colloid resins exhibit characteristics of both thermosetting and thermoplastic resins. Actually, acid colloid resins are new and unique textile finishing materials, intermediate between thermosetting monomers and fully polymerized thermoplastic resin emulsions.

Shrinkage control and crease resistance are obtained by treating fabrics with a solution of resin monomer and latent catalyst followed by drying, curing at elevated temperatures, and washing to remove unpolymerized resin. It has been proposed, in the case of rayon and cotton fabrics, that polymerization of the resin must take place within each fiber to produce these effects *(8)*. Large polymer molecules apparently cannot diffuse through the outer wall of cellulose fibers and are deposited on the surface. Cotton fabrics, in particular, suffer a marked loss in tensile and tear strength when treated with thermosetting resin monomers and the strength loss is attributed to an embrittlement caused by the polymerized resin within the fiber. Surface deposition of a resin on the fiber causes no embrittlement or loss in strength and indeed may result in increased tensile strength *(9)*. Surface deposition on the fiber also results in stiffness, depending upon the flexibility of the resin. Acid colloid resins exhibit excellent shrinkage control, stiffness, no loss in tensile strength but little or no crease resistance. From this, it must be inferred that acid colloid resins are deposited on the surface of the fibers. The unusual stabilizing action of these resins on fabrics, however, has several theories of explanation.

The stiff or crisp finish on fabrics obtained by use of thermoplastic resins is not particularly durable. Presumably, the resinous film around the fiber is broken or loosened by repeated flexing as in washing. The excellent retention of stiffness by acid colloid resin finishes on washing is unique. It is quite possible that acid colloid resins form a film around each fiber which is cross-linked to the cellulose wall. Such a tightly bound, adherent film should be quite durable and might also explain the stabilizing action of these resins.

As may be seen from this discussion, this unusual and comparatively unexplored approach to fabric finishing might well offer the answer to many of the unfilled requirements of the textile industry.

The preliminary investigation presented

in this report should stimulate additional research and study of these novel compounds.

Preparation of Acid Colloids

Heretofore, the application of acid colloids of resins has been limited "for the most part" to the preparation of high wet strength papers *(10)*.

In undertaking this present study, a wide range of resins and acids was investigated to determine the adaptability of each to practical colloid formation. Examination of tables I through X illustrates the wide range of resins, acids, concentrations and temperatures covered in this study.

A typical acid colloid may be formed by mixing 12 parts of Aerotex Resin M-3, 8 parts of glacial acetic acid and 80 parts of water. In about four hours the solution acquires a faint bluish opalescence, while in 24 hours the solution has the appearance of dilute skim milk and is ready for application. This bluish opalescence is characteristic of satisfactory acid colloid formation.

Resin Types Used in This Investigation

Aerotex Resin M-3—Methylated Trimethylol Melamine; *Aerotex Resin 605*—Unmethylated Trimethylol Melamine; *Aerotex Resin UM* — Unmethylated Methylol Melamine; *Resloom* HP—Unmethylated Methylol Melamine; *Resloom HP Special*—Unmethylated Methylol Melamine; *Resloom HH*—Highly Methylated Methylol Melamine; *Resloom M-75*—Methylated Methylol Melamine; *Aerotex Resin 801*—Ether Type of Dimethylol Urea; *Formaset SN*—Methylol Urea; *Formaset 10D*—Ethylene Glycol Ether of Dimethylol Urea; *RHonite* 470—Cationic Methylol Urea Syrup.

Effect of Various Additives on Acid-Colloid Solutions

With the complexity of finishes required today on the large variety of fabrics available, it seemed expedient to study the compatibility of an acid-colloid solution with a diversity of substances that might be considered as potential additives to obtain either moderating or related effects in the finished fabric. Selected for observation were nine salts, eight acids, eleven surface-active agents and sixteen finishing agents. Portions of 5 per cent (solids) Aerotex M-3: 3.7 per cent Acetic acid colloid were prepared, and to each of these a 2 per cent and a 20 per cent addition of each substance was made, based on the resin solids. Ob-

TABLE VII
Preparation of Acid Colloid of Resloom M-75 at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	10.0	7.5	82.5	Slight colloid—unsatisfactory
	4.0	7.5	88.5	No colloid formed
	10.0	10.0	80.0	No colloid formed
	10.0	5.0	85.0	No colloid formed
Formic, 90%	10.0	7.5	82.5	No colloid formed
	4.0	7.5	88.5	No colloid formed
	10.0	10.0	80.0	No colloid formed
	10.0	5.0	85.0	No colloid formed
Lactic, 85%	10.0	7.5	82.5	No colloid formed
	4.0	7.5	88.5	No colloid formed
	10.0	10.0	80.0	No colloid formed
	10.0	5.0	85.0	No colloid formed

NOTE: See Note 1. Table VI.

TABLE VIII
Preparation of Acid Colloid of Resloom HH at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	12.0	7.0	81.0	Precipitate
	10.0	7.0	83.0	Precipitate
	8.0	7.0	85.0	Satisfactory colloid
	6.0	7.0	87.0	Satisfactory colloid
	12.0	10.0	78.0	Precipitate
	10.0	10.0	80.0	Precipitate
	8.0	10.0	82.0	Satisfactory colloid
	6.0	10.0	84.0	Satisfactory colloid
Formic, 90%	12.0	7.0	81.0	Satisfactory colloid
	10.0	7.0	83.0	Faint colloid—unsatisfactory
	8.0	7.0	85.0	No colloid formed
	6.0	7.0	87.0	No colloid formed
	4.0	7.0	89.0	No colloid formed
	12.0	10.0	78.0	Satisfactory colloid
	4.0	10.0	84.0	No colloid formed
Lactic, 85%	12.0	7.0	81.0	Satisfactory colloid
	10.0	7.0	83.0	Satisfactory colloid
	8.0	7.0	85.0	Satisfactory colloid
	6.0	7.0	87.0	No colloid formed
	4.0	7.0	89.0	No colloid formed
	12.0	10.0	78.0	Satisfactory colloid
	4.0	10.0	84.0	No colloid formed
Succinic (200°F.) ..	4.0	7.0	89.0	Satisfactory colloid

NOTE 1. Succinic, Citric and Crotonic acids were investigated. In all experiments no colloid was formed because precipitation occurred, except in the one formulation given at 200°F.

NOTE 2. The stable acid colloids of Resloom HH formed in one to seven days in the absence of a catalyst.

TABLE IX
Preparation of Acid Colloid of Resloom HP (Special) at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	10.0	7.5	82.5	Gel formed
	5.0	7.5	87.5	Satisfactory colloid
	4.0	7.5	88.5	No colloid formed
	10.0	10.0	80.0	Precipitate
	10.0	5.0	85.0	Gel formed
Formic, 90%	10.0	7.5	82.5	Colloid formed
	5.0	7.5	87.5	Satisfactory colloid
	4.0	7.5	88.5	No colloid formed
	10.0	10.0	80.0	Satisfactory colloid
	10.0	5.0	85.0	No colloid formed
Lactic, 85%	10.0	7.5	82.5	Colloid formed
	5.0	7.5	87.5	Satisfactory colloid
	4.0	7.5	88.5	No colloid formed
	10.0	10.0	80.0	No colloid formed
	10.0	5.0	85.0	No colloid formed

NOTE: Succinic, Citric, Gluconic, Glycollic and Crotonic acids were investigated. No colloids were formed because precipitation occurred in all experiments.

Acid Colloids with Resloom HP Special form slowly in the absence of a catalyst (approximately 24 hours). 3-5 hours required when Catalyst AC was added.

TABLE X
Preparation of Acid Colloid of Rhonite 470 at 70°F.

Acid	*% Resin*	*% Acid*	*% Water*	*Results*
Acetic, Glacial	10.0	7.5	82.5	Satisfactory colloid formed

In laboratory experiments, Rhonite 470 was found to yield satisfactory colloids. However, due to lack of time, it was not possible to evaluate the efficiency of this material in a plant run. It should be noted that this product was the only urea-formaldehyde material investigated which gave a satisfactory acid colloid.

TABLE XI

Compatibility of 5% M-3 Acid Colloid With Various Substances
2% — Additives Based on Resin Solids — 20%****

I. Salts	*0 hrs.*	*4 hrs.*	*24 hrs.*	*0 hrs.*	*4 hrs.*	*24 hrs.*
$AlCl_3$	opalescent	opalescent	opalescent	milky	milky	milky
$MgCl_2$	opalescent	opalescent	opalescent	opalescent	milky	milky
$CaCl_2$	opalescent	opalescent	opalescent	milky	milky	milky
NH_4Cl	opalescent	milky	milky	large ppt	large ppt	large ppt
NaAc	clear	clear	clear	clear	opalescent	milky & gelatinous
Catalyst AC	turbid	turbid	milky	mod ppt	mod ppt	large ppt
Catalyst DAP	milky	milky	mod ppt	large ppt	large ppt	large ppt
NH_4OH	large ppt	large ppt	large ppt	large ppt	large ppt	large ppt
NaOH	large ppt	large ppt	large ppt	large ppt	large ppt	large ppt
II. Acids						
Sulfuric	ppt. opalescent after stirring	opalescent	opalescent	large ppt	large ppt gelatinous	large ppt gelatinous
Hydrochloric	ppt. opalescent after stirring	opalescent	opalescent	turbid	turbid	turbid
Phosphoric	ppt. opalescent after stirring	opalescent	opalescent	turbid	turbid	turbid
Formic	clear	clear	clear	clear	clear	clear
Oxalic	clear	clear	clear	opalescent	milky	mod ppt gelatinous
Citric	clear	clear	clear	opalescent	opalescent	opalescent
Lactic	clear	clear	clear	clear	clear	clear
Acetic	clear	clear	clear	clear	clear	clear
III. Surface Active	***0 hrs.***	***4 hrs.***	***24 hrs.***	***0 hrs.***	***4 hrs.***	***24 hrs.***
Triton N-100	clear	clear	clear	opalescent	opalescent	opalescent
Renex	clear	clear	clear	opalescent	opalescent	opalescent
TSP	ppt clears after stirring	clear	opalescent	mod ppt	large ppt	large ppt gelatinous
TSPP	ppt clears on stirring	clear	opalescent	mod ppt	large ppt settling	large ppt settled
Calgon	mod ppt	mod ppt settled	mod ppt settled	large ppt	large ppt settling	large ppt settled
Nacconol	opalescent	opalescent	opalescent	large ppt	large ppt	large ppt
Deceresol OT	turbid	small ppt settled	small ppt settled	mod ppt	large ppt	large ppt
Warco A-170	ppt clears on stirring	clear	opalescent	mod ppt	large ppt gelatinous	large ppt gelatinous
Dexad	milky	mod ppt settled	mod ppt settled	mod ppt	large ppt	large ppt
PVA	clear	clear	opalescent	opalescent	opalescent	opalescent
IV. Finishing Agents						
Acto Softener	clear	clear	opalescent	opalescent	opalescent	turbid
Warcolene	turbid	turbid	milky	mod ppt	mod ppt	mod ppt
Warco Softener	turbid	turbid	turbid	turbid	mod ppt	mod ppt settled
*Permel & Accel.	turbid	turbid	small ppt settled	large ppt	large ppt settled	large ppt settled
UF Paste	clear	clear	clear	clear	clear	opalescent
Softener H	clear	clear	clear	clear	clear	clear
*Zelan—6% NaAc	turbid	turbid	small ppt	turbid	small ppt	mod ppt
*Rhoplex WN—75	turbid	turbid	turbid	mod ppt	mod ppt	mod ppt settling
*Kandar	turbid	turbid	turbid	mod ppt	mod ppt	mod ppt settling
Dextrine	clear	clear	clear	clear	clear	clear
RTC	clear	clear	clear	clear	clear	opalescent
Corn Starch	clear	clear	clear	clear	clear	clear
Sol. Luxolene	turbid	turbid	turbid	mod ppt	mod ppt settled	mod ppt settled
*Merlon KR2	turbid	turbid	turbid	mod ppt	mod ppt	mod ppt
M-3	clear	clear	clear	opalescent	turbid gelled	milky gelled
*Aerotex 133	turbid	turbid	turbid	turbid	mod ppt	mod ppt

*Material turbid or milky.

servations made on the appearance and character of the colloidal solutions immediately following addition as well as after four and twenty-four hours are given in Table XI.

Viscosity and Turbidity Measurements During Acid Colloid Formation

It was observed that two acids, gluconic and glycollic, cause rapid acid colloid formation with melamine resins and frequently proceed to stable gels within 24 hours. Since the changes in viscosity and opalescence during acid colloid formation were to be investigated, these two acids were used with Aerotex Resin M-3 as the simplest system to study from an experimental standpoint.

Three series of experiments were carried out. In the first series, 10 per cent resin solids and 7½ per cent acid (100%) for both gluconic and glycollic acid were studied. The reactants were maintained at constant temperature of about 70°F. for 24 hours at which time both acids had produced solid gels.

A second series of experiments was then carried out with glycollic acid only using three different solutions as follows:

1. 10% M-3 solids, 7.5% glycollic acid.
2. 5% M-3 solids, 3.75% glycollic acid.
3. Same as (1) diluted one-half after 2 hours.

In these first two series of experiments, a viscosimeter was not available, and it was necessary to measure relative viscosities by timing the discharge of a 25 ml. pipette. Turbidity measurements were made with a Coleman Universal Spectrophotometer Model 14 at a wave length of

TABLE XII

Viscosity and Turbidity Changes During Acid Colloid Formation with 10% M-3 and 7.5% Glycollic and 7.5% Gluconic Acids

		Time in Hours					
		1	*2½*	*4¾*	*7½*	*10½*	*23½*
Viscosity*	(Gluconic	38	40	48	67	193	gel
	(Glycollic	34	36	47	149	gel	gel
Turbidity	(Gluconic	88	81	47	42	32	(72 Ludox)
	(Glycollic	92	90	63	49	19	(Control)

* Flow time for 25 ml. pipette.

TABLE XIII

Viscosity and Turbidity Changes During Acid Colloid Formation For 10 and 5% M-3 Solids Using 7.5 and 3.75% Glycollic Acid

		Time in Hours					
		0	*1*	*2*	*4*	*8*	*24*
Viscosity*	10% M-3	23	24	25	58	gel	gel
	5% M-3	34	36	36	37	39	40
	10% diluted to 5% after two hours	..	..	23	23	41	45
Turbidity	10% M-3	97	92	92	75	..	..
	5% M-3	92	93	94	93	87	80
	10% diluted to 5% after two hours	..	..	81	86	89	80

* Flow time for 25 ml. pipette.

546 mμ. The data obtained from these two series are shown in Tables XII and XIII.

A third set of experiments was carried out with glycollic acid using a resin-acid ratio of 4:3 and a resin concentration of 5, 7½, and 10 per cent solids. In this series, a Brookfield Viscosimeter was available to measure the viscosity of the colloids directly in centipoises. The data for this series are shown in Table XIV.

It is apparent from this work that formation of acid colloid is characterized by a gradual increase in turbidity. The viscosity change does not become apparent until shortly before gel formation. As the resin content is reduced the viscosity and turbidity changes are much slower and 5 per cent resin solutions do not show gel formation.

LABORATORY APPLICATIONS AND EVALUATION OF EFFECTS

Effect on Tensile Strength

Recognizing the usually severe loss in tensile strength of cellulosic fabrics when treated with formaldehyde resins, a series of experiments was designed to measure the extent of the loss that might reasonably be expected with the use of the acid-colloids of melamine resins, as compared with the use of the resins themselves or as compared to the tensile strength of the untreated fabric. Representing a wide cross section of types and constructions, laboratory samples of 80 x 80 print cloth, 136 x 60 broadcloth, several grades of dotted swiss and a 48 x 28 marquisette were padded with a variety of acid-colloids at various concentrations embracing the use of both methylated and unmethylated melamines and reacted with Acetic, Formic or Lactic acids. They were then dried and finally cured at temperatures ranging from 225° to 330°F. Without exception, the tensile strengths as determined on Scott machines under standard atmospheric conditions were found to be considerably higher than those fabrics run with the usual resin treatment, and indeed, so much higher that in the majority of cases no significant difference in strength could be determined between the acid-colloid treated products and their original untreated counterparts. Typical findings are given in Table XV.

TABLE XIV

Changes in Viscosity and Turbidity During Acid Colloid Formation With Aerotex M-3 and Glycollic Acid (resin-acid ratio 4:3)

		Time in Hours					
		0	*1*	*2*	*4*	*6*	*24*
Viscosity* (cps)	a. 10% M-3	3.5	5.6	15.5	99	gel	gel
	b. 7.5% M-3	3.3	5.5	7.0	98.5	gel	gel
	c. 5% M-3	2.7	2.8	4.0	6.0	12.0	90.5
Turbidity as% Transmittance	a. 10% M-3	97	95	96	..	..	..
	b. 7.5% M-3	90	88	89	79	..	..
	c. 5% M-3	94	98	97	95	95	89
Control (Ludox)		72					

* Brookfield Viscosimeter.

Effect on Tear Strength

Laboratory examination of the tear resistance factor indicated that the acid-colloid, although decreasing the tear strength of the base fabric was, nevertheless, substantially less severe than the same resin applied with a regular catalyst. See Table A.

Effect on Durability of Stiffness

Melamine-formaldehyde resins applied in a certain concentration range with a catalyst are characterized by a crispness that is considered to be highly desirable in many fabric finishes. Unfortunately, however, this stiffness is not fast to laundering, and a crisp organdy, lawn or mar-

TABLE XV

Effect on Tensile Strength Typical Data

Fabric	*Procedure*	*Drying*	*Curing °F.*	*Curing Minutes*	*Warp*	*Weft*
80x80 Print	Water—Control Base	Air	...	.	65	42
80x80 Print	7.5% Resloom HP: Catalyst AC	Air	300	3	55	41
80x80 Print	7.5% Resloom HP: 7.5% Formic Acid Colloid	Air	225	3	65	48
80x80 Print	7.5% Resloom HP: 7.5% Lactic Acid Colloid	Air	225	3	59	45
136x60 Broadcloth	Water—Control Base	Air	...	.	87	31
136x60 Broadcloth	7.5% Resloom HP: Catalyst AC	Air	300	3	89	27
136x60 Broadcloth	7.5% Resloom HP: 7.5% Formic Acid Colloid	Air	225	3	85	36
136x60 Broadcloth	7.5% Resloom HP: 7.5% Lactic Acid Colloid	Air	225	3	87	29
Dotted Swiss (a)	Water—Control Base	250	...	0	37	15
Dotted Swiss (a)	Plain Starch Finish	250	...	0	41	18
Dotted Swiss (a)	10% Aerotex M-3: 7.5% Acetic Acid Colloid	250	300	4	43	17
Dotted Swiss (b)	Water—Control Base	250	...	0	35	17
Dotted Swiss (b)	5% Aerotex M-3: 3.7% Acetic Acid Colloid	250	300	4	32	20
Dotted Swiss (c)	Water—Control Base	230	...	0	32	15
Dotted Swiss (c)	10% Resloom HP Spec.: 7.5% Formic Acid Colloid	230	225	3	32	15
Marquisette (a)	Water—Control Base	230	...	0	25	13
Marquisette (a)	10% Resloom HP Spec.: 7.5% Formic Acid Colloid	230	225	3	25	13

TABLE A

Fabric	Procedure	Elmendorf Warp	Elmendorf Weft
Dotted Swiss	Control—untreated	62	46
Dotted Swiss	5% Resloom HH & NH_4Cl Catalyst cured 4 min. @ 300°F.	42	25
Dotted Swiss	5% Resloom HH: 3.7% Acetic Acid colloid cured 4 min. @ 300°F.	54	41

quisette, for example, with a regular catalyzed resin finish becomes quite limp after a single laundering or dry cleaning. The acid-colloids of these resins were also found to be capable of imparting variable degrees of stiffness in the finished fabrics, and laboratory experiments were designed to determine the factor of their durability. To facilitate stiffness measurements in terms of Flexural Rigidity, these tests were made on 64x64, 3.15 mercerized and bleached sheeting brought to a crisp hand with 10% Aerotex M-3: 7.5% Lactic acid colloid by padding, drying at 190°F. curing for 2 minutes at 330°F., washing at 140°F. with a neutral detergent and finally drying to normal finished width. The stiffness of the product as found and after 1, 2, 3, 4 and 5 cotton washes (Federal Specification CCC-T-191A) was determined with the Pierce Flexometer under standard atmospheric conditions, and showed the unusually high retention results as in Table B.

Further portions of this same fabric were subjected to 1, 2, 3, 4 and 5 commercial dry cleanings by an accredited A.L.I. laundry and again tested on the Pierce Flexometer for durability of stiffness. These results showed good retention (see Table C).

Using the same base fabric, further laboratory trials were run to compare stiffness and durability of the acid colloids of both methylated and unmethylated melamines, reacting these with either Acetic or Formic Acid. Selecting Aerotex M-3 as a typical methylated type and Aerotex 605 as its unmethylated counterpart, 10% resin colloids of each were made up with both 7.5% Acetic acid and 7.5% Formic acid. Paddings were made with each, drying at 190°F. and curing for 2 minutes at 330°F. followed by a 20 minute afterwash and final framing to width at 280°F. Pierce Flexometer readings indicated that although differences in both stiffness and retention are obtained from colloids of methylated or unmethylated melamine, even greater variances may be expected with the use of a diversity of acids. Data obtained after 1 and 5 washes are shown in Table D.

TABLE B

	Flexural Rigidity Warp	Flexural Rigidity Weft	Mean	Stiffness Retention
Original	2242	1912	2060	....
1 Wash	1835	1685	1750	85%
2 Washes	1787	1475	1620	79%
3 Washes	1610	1645	1630	79%
4 Washes	1647	1512	1580	77%
5 Washes	1385	1505	1450	70%

TABLE C

	Flexural Rigidity Warp	Flexural Rigidity Weft	Mean	Stiffness Retention
Original	2297	1940	2105	....
1 Dry Cleaning	2285	1700	1970	94%
2 Dry Cleanings	1550	1275	1405	67%
3 Dry Cleanings	1300	1325	1310	62%
4 Dry Cleanings	1270	1170	1220	58%
5 Dry Cleanings	1320	1090	1200	57%

TABLE D

	Methylated Melamine Acetic Acid F.R.	Methylated Melamine Acetic Acid Retention	Methylated Melamine Formic Acid F.R.	Methylated Melamine Formic Acid Retention	Unmethylated Melamine Acetic Acid F.R.	Unmethylated Melamine Acetic Acid Retention	Unmethylated Melamine Formic Acid F.R.	Unmethylated Melamine Formic Acid Retention
Original	1948	....	2856	....	1708	....	2679	....
1 Wash	1788	92%	1909	67%	985	58%	2426	91%
5 Washes	824	42%	1122	39%	583	34%	1530	57%

TABLE E

Treatment	Spun Rayon Percent Shrinkages-Weft Scour	Spun Rayon Percent Shrinkages-Weft Wash	80x80 Print Cloth Percent Shrinkages-Weft Scour	80x80 Print Cloth Percent Shrinkages-Weft Wash
Control (untreated)	5.07	5.08	3.92	5.40
3% Acetic-colloid of M-3	1.51	2.87	....	1.96
6% Acid-colloid of M-3	0.75	1.35	....	1.31
10% Acid-colloid of M-3	1.06	1.51	....	1.13
1.5% Regular M-3	0.60	1.36	....	....
3% Regular M-3	1.20	1.35	1.14	1.80
4.5% Regular M-3	0.00	0.45	....	....
6% Regular M-3	0.30	0.60	0.49	0.82
10% Regular M-3	....	....	0.33	0.82

Effect on Shrinkage Control

By compiling shrinkage data on the entire range of samples used in the general laboratory evaluation of the acid-colloid process, it became very evident that extremely effective stabilization was being obtained on all fabrics treated. Since the results found, however, were derived from a plurality of tests primarily designed to examine a variety of dissimilar physical properties, a further series of laboratory tests were carried out specifically to compare the effectiveness of a methylated trimethylol melamine resin and its acetic acid colloid for shrinkage control on both cotton and rayon fabrics. The acid colloid solution was prepared by diluting Aerotex M-3 (10% solids) and adding Acetic acid (7.5% of 100% product). Five percent ammonium chloride based on M-3 solids was employed as a catalyst for the regular resin treatment. Thirty-six-inch fillingwise strips of 80x80 print cloth and a four-yard spun rayon fabric were treated with the resin and acid colloid solutions at varying concentrations on a three-roll pneumatic pad. The fabric strips were air dried on a pin frame at thirty-eight inches (two inches over original). Samples treated with the acid-colloid were cured at 230°F., for four minutes while the samples treated with regular resin were cured at 300°F. for five minutes. Shrinkage control was measured by subjecting each sample to a mild scour and then to a more vigorous wash. The scour was carried out in a Launderomat at 150-160°F. for ten minutes in 0.1% Actopon and 0.1% soda ash. The washing was also carried out in the Launderomat at 150-160°F. for twenty minutes using 0.2% soap, 0.07% soda ash and 0.07% TSPP. After each operation, the samples were slack-dried, remoistened, ironed without tension, and measured (See Table E).

It was concluded from this series of tests that both catalyzed melamine and the acid-colloid of melamine are effective for shrinkage control of both cotton and rayon fabrics. However, on an equal solids basis, it would appear that approximately twice as much acid-colloid as normally applied resin is required to obtain a comparable degree of stabilization. This was further emphasized by a series of laboratory trials on a 48x28 mercerized cotton marquisette in which colloids of 10% Aerotex M-3 with 7.5% Acetic acid

TABLE F

Application	Shrinkage Warp	Shrinkage Weft
10% M-3 Colloid (7.5% Acetic acid)	2.2%	4.8%
5% M-3 Colloid (3.7% Acetic acid)	2.3%	6.1%
10% Aerotex M-3: Accelerator #187	1.6%	4.0%
5% Aerotex M-3: Accelerator #187	1.3%	5.0%

(100% product) as well as 5% Aerotex M-3 with 3.7% Acetic acid were compared for their shrinkage stabilizing effect with regular applications of 10% and 5% Aerotex M-3 catalyzed with 3% Accelerator #187 (based on resin solids). After padding, all samples were pin framed to a common dimension, dried at 280°F. and cured for three minutes at 335°F. Shrinkages obtained after one CCC-T-191A cotton wash are shown in Table F.

Effect on Abrasion Resistance

The application of acid-colloids yielded a marked improvement in fabric abrasion resistance as measured by the Taber Abraser. Typical data on bleached base fabric treated with the acid-colloid show an increase in resistance with the concentration used as shown in Table G.

TABLE G

Example I Percent Acid-Colloid	80x80 Sheeting Taber Wearcycles
0	175-250
3	300-475
6	800-1000
10	1300-1700

Example II Percent Acid-Colloid	144x76 Broadcloth Taber Wearcycles
0	250-275
3	1170-1700
6	3000-4875
10	3400-5300

Effect on Crease Resistance

TBL tests on a variety of acid-colloid treated fabrics showed little crease-proofing action. In general, it appears that the crease resistance characteristic of melamine resins is not developed by application in the acid-colloid medium.

Effect on Chlorine Retention

Measuring the intensity of the yellow discoloration of the Melamine resin-chlorine complex found in bleaching as indicative of the chlorine retention of the processed fabrics, laboratory samples treated with equal concentrations of resin and its acid-colloid showed no significant difference in their sensitivity to hypochlorite bleaching baths.

Effect of Curing Temperatures

A series of acid-colloid padded fabrics were subjected to a wide range of curing temperatures. By measuring the original percent add-on, and after curing and washing, remeasuring for loss of solids, it was determined that an adequate cure yielding less than 0.5% loss in weight after washing could be obtained at temperatures as low as 225°F. As with a catalyzed resin process, the time factor depends on the fabric treated and may be shortened at higher temperatures. The diversity of curing temperatures used in the experimental program was largely determined by the available facilities of the various cooperating laboratories, and has served to further emphasize this unusually flexible aspect of the process.

Plasticizers for Acid-Colloids

Exploratory evaluation of a large number of possible plasticizers compatible with the acid-colloid solution and with an apparent minimum effect on the shrinkage stabilization and wash durability of the treated fabric, narrowed more extensive trials to four materials: Sterox No. 6, Rezyl XR 1223, Arquad 2HT and Rhotex 200. A series of experiments was carried out to further compare the effectiveness of these plasticizers. Since a limited supply of Rezyl 1223 prevented its being included in this series of tests, it was decided to further evaluate in its stead a typical cationic softener which on first evaluation had been reported as adversely affecting shrinkage control. A bleached mercerized dotted swiss fabric was cut into fillingwise strips and padded through the plasticized acid-colloid mixes. The acid-colloid for these experiments was prepared with Aerotex M-3 and glycollic acid. The colloid was prepared at a resin concentration of 10% and diluted to 7.5% strength after colloid formation was observed. The samples were air-dried on a pin frame, cured for 5 minutes at 300°F., neutralized by hand in a soap solution and again air-dried on a pin frame. Portions of each sample were taken and subjected to a standard CCC-T-191A cotton wash to determine shrinkage control. Samples of the treated and washed fabric were tested with the Schiefer Flexometer for flexural rigidity.

These test results are summarized in Table XVI.

From observation of handle, it appears that Sterox, Arquad, Softener H and Rhotex 200 are all effective plasticizers for acid-colloids; however, 5% Sterox and 1% Rhotex 200 showed somewhat higher shrinkage than the unplasticized control. Subsequent laboratory trials with acid-stable Rezyl XR-1223 indicate that this material also yields a marked plasticizing action and with but negligible effect upon wash-durability and shrinkage control.

Pigment Dyeing With Acid-Colloid Binder

Inasmuch as acid-colloids may be considered intermediate between the usual thermosetting monomer resins and the fully polymerized thermoplastic resins, it was considered advisable to evaluate these materials as binders for dye pigments. Two different approaches have been used to date in applying pigment dyes to fabrics. The first involves dispersion of the dye pigments into a non-aqueous solution of resin binders; urea-formaldehyde and alkyd resins are usually employed. The pigment-resin phase is then dispersed in water to form an oil-in-water emulsion which can be diluted and padded as desired. The second approach to pigment dyeing involves the use of pigment dyes dispersed in water which can be blended at the time of application with thermoplastic resin emulsions or thermosetting water-soluble monomers. In this

TABLE XVI

Effect of Plasticizers on Shrinkage Control and Hand of Acid Colloids
Flexural Rigidity (Schiefer)

	Warp	Fill	Mean	Plas. Action %	% Retention On Washing	% Shrinkage (Fill)
Untreated Fabric	34	23	27	...	..	..
Control, 7.5% M-3 Colloid	220	129	169	...	..	..
Control, 7.5% M-3 Col. Washed	288	74	146	...	86	1.0
5% Sterox	48	18	29	99	..	..
5% Sterox, Washed	40	18	27	...	93	4.0
1% Sterox	74	7	23	103	..	..
1% Sterox, Washed	62	26	40	...	Over 100	1.8
0.25% Arquad 2 HT	55	32	43	89	..	..
0.25% Arquad 2 HT, Washed	116	27	55	...	Over 100	1.9
1% Softener H	117	35	64	74	..	..
1% Softener H, Washed	140	24	58	...	91	2.1
1% Rhotex 200	103	29	55	80	..	..
1% Rhotex 200, Washed	112	27	57	...	Over 100	3.5

instance the latter system was compared with an acid colloid resin-pigment dye. Preliminary work on a wide range of pigment dyes available indicated that they could be classified into four groups according to their behavior with acid-colloids (See Table XVII). The first group of only three pigments was found to be completely compatible with acid-colloids under all conditions. The second group exhibited a fair compatibility and is believed to be suitable for production use. The third group of pigment dyes has only limited compatibility and shows evidences of flocculation after standing a few minutes in an acid-colloid solution. The fourth group represented those products found incompatible with acid-colloids and which immediately flocculate or precipitate upon mixing. An effort was made to evaluate the pigments of the first three groups in a standard pigment dyeing formula and in an acid-colloid formula. The acid-colloid-pigment dispersion was prepared by blending equal parts of a 2% pigment dispersion in water with a 5% acid-colloid solution prepared with Aerotex M-3 and acetic acid. Strips of 80x80 print cloth were padded with the pigment-resin dispersion, air-dried, cured for 3 minutes at 300 degrees F., washed lightly in a neutral detergent in a Launderomat at 160°F. and press dried. A typical pigment dyeing formula was selected as a control for the acid-colloid binder which contained the following ingredients:

0.2% Dispersing Agent (alginate type)
2.0% Sherdye Clear
2.0% Rhoplex FRN
2.5% Aerotex M-3
1.0% Pigment Dye
0.125% Catalyst DAP.
Adjusted to pH 8.0 with ammonia.

Samples of 80x80 print cloth padded with this type of pigment dye formulation were dried, cured, and washed under the same conditions employed for the acid-colloid. Two series of fabrics were prepared using the same pigments with both binders. The samples were then tested simultaneously for wet and dry crocking, wash fastness (A.A.T.C.C. No. 4), light fastness, and resistance to scrubbing, and the results evaluated. A critical inspection of the tests revealed that the acid-colloid-pigment combination has excellent fastness. In general, the acid-colloid binder is equivalent to the combination of binders used in the formulation described above. A few of the acid colloid-pigment dyed samples showed speckiness due to limited compatibility of the pigment and resin. In the case of Ponsol Golden Yellow GK, the light fastness of the color in the acid-colloid system was very poor. Upon the basis of this work, it would be concluded that acid-colloid resins are quite effective as pigment binders. There is a need for additional pigment colors fully compatible with the acid-colloids, but these can no doubt be furnished by dyestuff manufacturers.

Effect on Wash Fastness and Light Fastness of Direct Color Dyeings

In a preliminary study of the effect of acid-colloids on wash fastness of direct dyes, it appeared that Aerotex M-3 was less effective as an acid-colloid than as a straight melamine resin on wash fastness of several direct colors. However, this work was carried out with one colloid (namely, Aerotex M-3 and acetic acid) and in view of the fact that a patent* was obtained for an acid-colloid to be used to improve the wash fastness of direct dyes, it was decided to conduct additional tests using different resins and different acids on the same dyestuff. Fastolite Blue RL was selected as the direct dye and was applied at a concentration of approximately 1% on 80x80 cotton print cloth and an all-viscose spun novelty fabric.

Portions of the direct dyed cotton and viscose were treated with acid-colloids made as follows:

1. Aerotex M-3 and acetic acid
2. Aerotex M-3 and formic acid
3. Aerotex M-3 and lactic acid
4. Aerotex M-3 and gluconic acid
5. Aerotex M-3 and glycollic acid
6. Aerotex M-3 and hydrochloric acid
7. Resloom HP Sp. and formic acid
8. Resloom HP Sp. and lactic acid
9. Resloom HP Sp. and acetic acid

In all cases, 5% resin solids in the form of acid-colloid was applied to the dyed fabrics. The resin-acid ratio was maintained at 4:3 in the preparation of these acid-colloids. The colloids were used six hours after preparation (except in the case of M-3 with formic, lactic, and hydrochloric acids which stood overnight).

The entire series of samples were evaluated under identical conditions for wash fastness and light fastness. Twenty hours exposure in the Fade-Ometer was sufficient to differentiate the samples for light fastness and a standard No. 3 wash test (A.A.T.C.C.) was used for measuring wash fastness.

It was apparent that a wide difference existed in the effect of different acids and resins on the fastness properties of direct dyes. Aerotex M-3 and acetic acid was undoubtedly the poorest from the standpoint of wash fastness, whereas the combination was fairly good from the standpoint of light fastness. Gluconic and hydrochloric acid were quite effective in improving wash fastness but at the same time had a very marked effect on reducing light fastness. The three acids used with Resloom HP Special differed very little. The best results from the standpoint of both wash fastness and light fastness were obtained with formic acid with either Aerotex M-3 or Resloom HP Special. However, the straight melamine resin had approximately the same effectiveness as the acid-colloid prepared with formic acid.

* U. S. Patent #2,431,562.

TABLE XVII

Pigment Dye Classification Based on Compatibility With Acid Colloid Resins

Group A—Completely Compatible
- Carbon Dispersion T (Binney & Smith)
- Scarlet RMM Paste (duPont)
- Lithosol Yellow 3GD (duPont)

Group B—Fair Compatibility
- Calcotone Yellow G (Calco)
- Aridye BX Yellow (Aridye)
- Lithosol Blue GL Paste (duPont)

Group C—Limited Compatibility
- Calcotone Black G (Calco)
- Calcotone Green G (Calco)
- Calcotone Yellow M (Calco)
- Calcotone Pink G (Calco)
- Calcotone Blue G (Calco)
- Aridye BX Green B (Aridye)
- Aridye BX Blue 2G (Aridye)
- Monastral Blue BF Paste (duPont)
- Monastral Green GFP Paste (duPont)
- Lithosol Fast Blue BCS Paste (duPont)
- Lithosol Fast Blue GLRP Paste (duPont)
- Lithosol Fast Yellow ARP Paste (duPont)
- Ponsol Golden Yellow GK Double Paste (duPont)

Group D—Incompatible
- Aridye Black BX 9210 (Aridye)
- Monastral Fast Green G Press Cake (du Pont)
- Monastral Fast Blue BS Press Cake (du Pont)
- Lithosol Fast Blue BCS Press Cake (du Pont)
- Ponsol Blue BCF Paste (duPont)
- Ponsol Jade Green Double Paste (duPont)
- Calcosol Yellow G Double Paste (Calco)
- Maroon Pigment Paste (Imperial)
- Violet Pigment Paste (Imperial)
- Black Pigment Paste (Imperial)
- Blue Pigment Paste (Imperial)
- Green Pigment Paste (Imperial)

Effect on Light Fastness of Vat Color Dyeings

A series of laboratory experiments were carried out to examine the comparative effects of melamine and acid-colloids upon the light fastness of a group of vat dyed fabrics. Acid-colloid solutions were prepared with 10% Aerotex M-3 (solids) and 7.5% Acetic acid (solids), also with 10% Resloom HP and 7.5% formic acid as well as with 10% Resloom HP and 7.5% lactic acid. The regular resin treated fabrics and samples of each of the acid-colloid products were then exposed to 40 hours in a type FDA-R Fade-Ometer. The relative fading observed between the resin and acid-colloid treatments was as in Table H.

With the exception of Indanthrene Red FBBA, it is apparent that the acid-colloid of melamine resin had decidedly less effect on the light fast properties of these vat dyeings than the regular resin-catalyst

TABLE H

Resin vs. Acid-Colloid Process—Relative Fading of Vat Color Dyeings

40 Hrs. Exposure—Type FDA-R Fade-Ometer

Dyeing	*M-3 and Catalyst*	*M-3: Acetic Colloid*	*HP: Formic Colloid*	*HP: Lactic Colloid*
Ponsol Blue BF	Trace	Negligible	Negligible	Negligible
Ponsol Jade Green	Noticeable	Negligible	Negligible	Negligible
Ponsol Brown VR	Appreciable	Noticeable	Noticeable	Noticeable
Ponsol Violet AR	Appreciable	Trace	Trace	Trace
Ponsol Olive AR	Noticeable	Trace	Trace	Trace
Indan. Red FBBA	Trace	Noticeable	Noticeable	Noticeable
Indan. Yellow Brown 3GA	Appreciable	Noticeable	Trace	Trace

process. The degree of improvement, however, would appear to vary somewhat with the acids used as well as upon the particular dyestuff characteristics. In each instance, the acid-colloids produced a more pronounced tonal change than the regular resin process.

Summary

In the evaluation of the acid colloids of resins for textile finishing it was necessary to determine the methods of preparation and the range of resin and acid which might be utilized. Seven melamine formaldehyde resins and four urea formaldehyde resins were studied. Although more than fifteen acids were investigated, major emphasis was given to organic acids since mineral acids were considered undesirable for textile use.

An effort was made to determine the concentration ranges for acid colloid formation with each resin and a series of acids. Although the data cannot be considered complete, a rather comprehensive series of tests was undertaken.

The methylated trimethylol melamine showed the widest range of conditions favorable for acid colloid formation. Some acids such as gluconic and glycollic were satisfactory for methylated resins but were not satisfactory for unmethylated resins.

The ability of different acids to form colloids is not a function of pH and no obvious explanation of this behavior has been found.

It is particularly interesting to note that only one urea-formaldehyde type resin showed acid colloid formation. Apparently the colloidal aggregates formed by the urea resin are not stable and proceed rapidly to the precipitation stage.

From a study of the compatibility of many chemicals with acid colloids it is apparent that these colloids are cationic in nature. Probably the stability of the acid colloids depends upon the peptizing action of hydrogen ions.

Conclusions

a. Acid colloids of resins are unique in that they require only a low temperature for curing.

b. They have, as shown, excellent retention of rigidity of "hand" after laundering such as is not possible with resins in common use.

c. In application to textiles, particularly cotton, there is no loss in tensile strength.

d. In the formation of acid colloids of resins no double bonded acids were found which would produce an acid colloid. pH of the acid was not the determining factor.

e. It was found that several melamines, but to date only one urea resin (Rhonite 470), would form suitable acid colloids.

f. In addition to retention of "hand" a laundering stabilization to shrinkage is to be noted.

g. Acid colloids do not develop crease resistance.

h. Several types of plasticizers may be applied with the acid colloid without affecting the desirable properties.

i. Acid colloids provide a suitable medium for the application of pigment dyes.

j. Acid colloid treated fabrics showed a marked improvement of abrasion resistance.

From the studies initiated and the work completed it is evident that a new method of approach to the application of resins on textile fabrics has been developed.

Acknowledgment

We wish to express our appreciation to the following companies for their contribution of the services of their personnel, materials, and equipment: Airedale Worsted Mills, American Cyanamid Company, Apponaug Company, Cranston Print Works, Glenlyon Print Works, Lincoln Bleachery & Dye Works, Mount Hope Finishing Company, Rhode Island State College, Sayles Finishing Plants, Inc., Slatersville Finishing Company, United States Finishing Company, Warwick Chemical Company.

Bibliography

1. Alexander, J., Colloid Chemistry, Vol. I, p. 17. Reinhold Publishing Corp., (1932).
2. Ellis, C., "The Chemistry of Synthetic Resins", Vol. I. Reinhold Publishing Corp., (1935).
3. Shapiro, L., Rayon Synthetic Textiles, **30**, No. 7, 8, 9, (1949).
4. Anon., Am. Wool Cotton Reptr. **63**, No. 32, 13 (1949).
5. Buck, G. S., and McCord, F. A., Textile Research J. **19**, 216 (1949).
6. Lynn, J. E., Am. Dyestuff Reptr. **35**, 653, (1949).
7. Gruntfest, I. J., and Gagliardi, D. D., Ind. Eng. Chem., **41**, 760 (1949).
8. Cameron, W. G., and Morton, T. H., J. Soc. Dyers Colourists, **64**, 329, (1949).
9. Chase, H. M., Am. Dyestuff Reptr. **33**, 474, (1944).
10. U. S. Patents: 2,431,562; 2,417,014; 2,291,080; 2,291,079; 2,345,543; 2,423,428; 2,423,429; 2,145,011.

APPENDIX

PLANT APPLICATIONS

Colored Yarn Dotted Swiss

Construction

76x56 8.62 35½"

Batch Formula

40 lbs. Aerotex M-3 Resin
30 lbs. 80% Acetic Acid
460 lbs. Water

This master batch was split as follows:

#1. 105 lbs. of Master Batch
No plasticizer added

#2. To 105 lbs. of Master Batch was added 5 oz. Arquad 2HT

#3. To 105 lbs. of Master Batch was added 3 lbs. of Sterox #6.

#4. To 105 lbs. of Master Batch was added 1 lb. of Rhotex 200

#5. To 105 lbs. of Master Batch was added 3 lbs. of Rezyl XR-1223.

The fabrics were padded on a two roll pad at 85% pickup and while still damp, swing framed, at 275°F. and cured at 300°F. for two minutes. Then jig scoured with detergent and soda ash at 140°F. and finally frame dried.

Shrinkage stabilization and tensile strengths were as follows:

	% Shrinkage		Tensile Strength	
	Warp	Weft	Warp	Weft
Original Untreated	..	..	32.0	13.0
Colloid Without Plasticizer	0.6	1.4	32.5	11.5
Arquad 2HT	1.0	2.2	30.5	11.0
Rezyl XR-1223	1.0	1.9	32.5	11.5
Sterox #6	1.2	1.8	32.5	11.5
Rhotex 200	1.0	2.0	32.5	12.5

Flexural Rigidity Values on Colored Yarn Dotted Swiss Plant Run With Acid Colloid Resins and Plasticizers

	Warp	Filling	Mean	% Retention
Dotted Swiss				
Control	213	85	134	
Washed	117	62	85	63.4
Rhotex	191	56	135	
Washed	146	53	88	65.2
Rezyl	117	99	108	
Washed	114	69	89	82.5
Arquad	69	58	53	
Washed	78	28	47	74.6

Cotton Marquisette

Construction

50x32 7.35 47"

Batch Formula

10 lbs. Resloom HP Special
8 lbs. 85% Formic Acid
82 lbs. Water

After standing overnight the colloid was formed and the fabric treated on a two-roll pad at 85% pickup, frame-dried at 275°F. and cured for 2 minutes at 300°F. in a gas-fired cure box. Then soaped on a jig for ½ hour at 140°F. in 0.5% synthetic detergent and 2% soda ash solution and finally frame-dried.

Shrinkage stabilization and tensile strength were as follows:

	% Shrinkage		Tensile Strength	
	Warp	Weft	Warp	Weft
Original Untreated	..	..	25	13
Acid Colloid Treated	1.1	1.9	25	13

Printed Lawn

Construction

80x80 8.50 40"

Batch Formula

40 lbs. Aerotex M-3 Resin
30 lbs. 80% Acetic Acid
460 lbs. Water

The Master Batch was split as follows:

#1. 105 lbs. of Master Batch
No plasticizer added

#2. To 105 lbs. of Master Batch was added 5 oz. Arquad 2HT

#3. To 105 lbs. of Master Batch was added 3 lbs. Sterox #6

#4. To 105 lbs. of Master Batch was added 1 lb. of Rhotex 200

#5. To 105 lbs. of Master Batch was added 3 lbs. Rezyl XR-1223.

The fabrics were padded on a two-bowl pad at 85% pickup and while still damp were swing framed at 275°F. and cured at 300°F. for 2 minutes. Then jig scoured with detergent and soda ash solution at 140°F. and frame-dried.
Shrinkage stabilization and tensile strength were as follows:

	% Shrinkage		Tensile Strength	
	Warp	Weft	Warp	Weft
Original Untreated	..	..	26.0	10.5
No Plasticizer	0.5	1.7	27.0	10.0
Arquad 2HT	0.9	1.7	26.0	9.0
XR-1223	0.3	1.7	29.0	10.0
Sterox #6	0.5	2.0	27.0	10.5
Rhotex 200	1.0	1.8	25.5	9.0

Flexural Rigidity Values on Cotton Lawn Plant Run With Acid Colloid Resins and Plasticizers

	Warp	Filling	Mean	% Retention
Lawn				
Control	235	136	177	
Washed	110	48	65	36.7
Rhotex	153	102	124	
Washed	118	24	53	42.8
Rezyl	164	52	92	
Washed	156	45	84	91.3
Arquad	84	31	51	
Washed	35	21	27	53.0

Rayon Marquisette

Construction

44x28 10 yard 45"

A practical trial using Aerotex M-3, Gluconic acid 50% and Rezyl XR-1223 and 1015 was run on a pneumatic 3-roll mangle. The mix was made up as follows:

12% M-3 — 10% by weight
23% Gluconic Acid 50%

After standing three hours it was diluted to make a 5% solution. One piece of rayon marquisette was run through this mix and then 5% (by volume) of Rezyl XR-1015 was added and impregnated into another piece, while a third piece was impregnated with 5% Rezyl XR-1223 in place of the XR-1015. The pieces were frame-dried only at 290°F.

Wash tests were as follows:

	Warp Shrinkage
Reg. Aerotex M-3 acid colloid	6.25%
M-3 Acid & Rezyl XR-1015	5.55%
M-3 Acid & Rezyl XR-1223	5.7 %
M-3 Acid & Rezyl XR-1223 (re-cured)	6.25%

Nylon Marquisette

Batch Formula (full strength)

10 lbs. Aerotex Resin M-3
10 lbs Acetic Acid—56%
60 lbs. Water at 90°F.

After standing overnight, the colloid was formed and the fabric treated on a pneumatic 3-roll mangle, with a pickup of 30%. The goods were then frame-dried only at 320°F. at a speed of 60 yards per minute.

Note: This application was for the purpose of producing a satisfactory hand and slippage control on the Nylon fabric.

A Satin Stripe Chambray

The fabric selected for this trial was a combed yarn, novelty chambray of the following specifications: 38 inches, 80x76, 4.00 yards per pound. Before finishing, the fabric had been desized, scoured, bleached, and mercerized.

An acid colloid resin was prepared using Aerotex M-3 and acetic acid. A 10-gallon batch was made up containing 10% by weight of resin and 7½% by weight of acetic acid. After standing overnight, the acid colloid was diluted to 5% resin and applied to approximately 120 yards of the chambray fabric.

Resin solution was padded on the fabric with a pickup of 70%, using a two-bowl mangle normally employed for finishing cottons. The fabric then entered a 90 ft. swinging tenter frame operating at a temperature of 280°F. Curing was carried out on a loop drier using a temperature of 300°F. for approximately three minutes. The fabric was neutralized by rope soaping, dried on a loop drier, and finished on an over-feed tenter frame with a solution containing 1% vegetable oil softener and 1% of a cationic softener.

The acid colloid finish on this fabric was evaluated in comparison with the regular non-durable finish obtained by the use of starch and a tallow softener. Sanforize wash tests were used to determine shrinkage control, tensile strength determinations were made after four hours conditioning at 70°F. and 65% relative humidity.

The shrinkage control and retention of tensile strength are considered excellent. The hand of the fabric was pleasing and considered more "lively" than the starch finish. The data are tabulated below:

	Cotton Wash Test % Shrinkage		*Tensile*	
	Warp	*Fill*		
Reg. Starch Finish	(sanforized)		35	30
5% M-3 Acid Colloid	1.0	2.8	45	33

Comparison of Acid Colloid With Standard Resin and Latent Catalyst Process

80x80 Cotton Print Cloth

Batch Formula

25 lbs. Aerotex M-3
25 lbs. Acetic Acid 56%
19 gals. Water

25 gals. Total

Mix and let stand 15 hours

This Master Batch was split as follows:

A. 15 gals. Resin Colloid
10 gals. Water

25 gals. Total

B. 7½ gals. Resin Colloid
17½ gals. Water

25 gals. Total

—Solutions—

C. 15 lbs. Aerotex M-3 (80% solids)
6 oz. Accelerator #187.
Made up to 25 gallons with Water

D. 7½ lbs. Aerotex Resin M-3 (80% solids)
3 oz. Accelerator #187.
Made up to 25 gallons with Water

The fabrics were padded through the above mixings using one dip and one nip with the pad expression at 80%. The fabrics were frame-dried at 260°F. for one minute. They were cured at 300°F. for three minutes followed by open width wash in synthetic detergent at 70°F. The goods were then festoon-dried at 280°F. and short framed to 36 in.

Resin Used	*Fin. Width*	*Wash Width*	*Shrinkage W.*	*Shrinkage F.*	*Str. W.*	*Str. F.*	*TBL Abrasion*	*Crease Resist W.*	*Crease Resist F.*
A 6% Aerotex M-3 Colloid	36⅝	35	2.3	2.7	58	42	7640	2.1	1.9
B 3% Aerotex M-3 Colloid	36¼	35	3.1	2.7	58	46	8150	2.0	2.1
C 6% Aerotex M-3 Solution & Catalyst	36	35⅜	2.7	0.9	46	30	3780	2.8	2.8
D 3% Aerotex M-3 Solution & Catalyst	35⅞	35	3.3	1.6	54	31	3580	2.3	2.6

Worsted Gabardine Shirting

Batch Formula

100 lbs. Lanaset Resin
100 lbs. Acetic Acid—56%
600 lbs. Water at 90°F.

The goods were given a one minute impregnation in the above colloid, squeezed (70% pickup) and dried at 200°F. After curing at 238°-268°F., the cloth was dolly washed and finally pin frame dried at 200°F. Dry finishing operations were carried out in the usual manner.

	% Shrinkage Warp	*Weft*
Relaxation	0.0	0.0
Felting (5 wool washes)	+1.0	+1.5

CALENDAR

COUNCIL

Meeting: January 13 (New Yorker, New York).

RESEARCH COMMITTEE

Meeting: January 13 (New Yorker, New York).

NATIONAL CONVENTIONS

1950: September 28 to 30, Portsmouth, N. H.
1951: October 18 to 20, Statler, New York
1952: Boston.

NEW YORK SECTION

Meetings: Jan. 13 (Hotel New Yorker, New York), Mar. 3 (Hotel Statler, New York), April 7, May 5 (Kohler's Swiss Chalet, Rochelle Park, N. J.), June 16—Outing.

NORTHERN NEW ENGLAND SECTION

Meeting: December 2 (Hotel Vendome, Boston).

PHILADELPHIA SECTION

Meeting: January 13 (Kugler's, Philadelphia).

SOUTHEASTERN SECTION

Meeting: December 3 (At French Textile School, Georgia Institute of Technology).

WESTERN NEW ENGLAND SECTION

Meeting: December 9, Hotel Green, Danbury, Conn.

Auxiliaries and Testing Group—

STATIC IN TEXTILE PROCESSING*

D. J. LEHMICKE
Rayon Department, E. I. du Pont de Nemours and Company

Introduction

PROCESSING difficulties attributable to the formation and accumulation of electrostatic charges have long been known in the textile industry. However, until recently the problem has not been serious and its solution has been relatively easy. The cotton processer could achieve freedom from static troubles by selection of the proper relative humidity for each of the processing steps involved. The spinner of wool usually applied relatively large amounts of oil to lubricate and protect the fibers; these quantities of oil were usually effective in preventing static. With the later development of wool oils more efficient for lubrication and protection, it began to be recognized that static prevention was necessary in the processing of wool. If a smaller amount of a given oil is required for proper lubrication, then that oil must also be a more efficient antistatic, and some thought must be given in its compounding to achieve the prevention of static.

With the introduction of the cellulose derivatives, particularly acetate rayon, the problem of static assumed greater importance and the producer of the fiber, as well as the processer, was faced with the task of overcoming its effects. Still more recently the use of the true synthetic fibers, with their very low water absorption, has led to static difficulties in many more phases of textile processing.

Causes and Effects of Static

The term "static" usually refers to the observable effects of the accumulation of electrostatic charges. When two dissimilar materials are pressed together, one of the two, having a greater affinity for electrons, will collect a few such electrons on its surface, at the expense of the second material. When the materials are separated, the material of higher electron affinity will retain these extra electrons and thereby have a negative charge. The second material, now being deficient in electrons, will have a positive charge. The transfer of electrons may be greatly increased by rubbing, which promotes more intimate contact of the surfaces.

This phenomenon of the generation of electrostatic charges is quite general. It probably occurs whenever two dissimilar materials come in contact or, more especially, are rubbed together. However, only very rarely and under certain conditions are there any observable effects.

In the first place, the charges must be retained and accumulated so that a potential of sufficient magnitude is obtained to produce a physical effect. Usually the offending substance is a dielectric, on which the charges remain at the point of generation. In the case of a conducting material, the charges distribute themselves over the entire surface of the body and if the body happens to be grounded, the charges are completely removed. However, an isolated metallic body can accumulate a large charge.

Secondly, the surrounding atmosphere should be dry, for humid air quickly dissipates the charges.

The first case in which there is an observable effect is one in which a sufficiently large charge is accumulated to result in a spark discharge when the charged object is brought near a conductor. An example of this is the spark produced by a person walking on a wool or nylon rug and touching a doorknob or light switch, or by sliding on a plastic automobile seat cover and touching the door lever of the car. Another example is the pouring of a liquid from an ungrounded container. If the container be touched to the receiver, a spark often occurs. This spark is usually too small to be seen, but if the liquid happens to be inflammable, the results may be highly noticeable. Perhaps the most common, and certainly the most spectacular electrostatic spark, is lightning. Here the accumulated small charges of tiny water droplets give to a cloud a tremendous potential, either positive or negative. The discharge may be between two clouds which have accumulated opposite charges, or from a cloud to the earth, which is both an infinite supplier and an infinite receiver of electrons.

The second case of noticeable effect in static accumulation is that where the charged body has a very small mass and a very large surface so that the relatively small forces involved cause motion. Such things as fibers, fabrics, and films fall into this classification, and the effect of static on them represents the type of problem with which the textile industry is most concerned. The individual filaments in a yarn will all accumulate charges of the same sign when the yarn passes over a guide, for example. Having the same charge, the filaments will repel each other. If the yarn and guide materials are such that the charges generated are large, and if the atmosphere is dry so that the charges are not dissipated, the repulsion may be strong enough to cause the yarn to balloon. This can result in damage to the yarn, loops, running out of guides, and other processing difficulties. Conversely, the charged yarn may be attracted to an oppositely charged surface, or even to a neutral surface to which the yarn can give an opposite charge by induction. This attraction to other objects can also interfere in many ways with the smooth running of a particular operation. Some of the specific results of accumulation of electrostatic charges will be discussed later.

A third case of observable effect of static is the attraction of very light particles by a charged body. This attraction is used in the most fundamental demonstration of static electricity, in which an object is electrified by rubbing and then brought near a hanging pith ball. The motion of the pith ball toward the object is proof that the object is charged. This effect is brought about by an induced charge on the pith ball. If a positively charged object is brought close to the pith ball, negative charges are attracted to the near side. In effect, the pith ball is now negatively charged and is attracted to the object. If

* Presented at the Auxiliaries and Testing Group Meeting, Atlantic City Convention, October 14, 1949.

the object had been negatively charged, electrons would be repelled to the far side, leaving the near side positively charged so that the pith ball would again be attracted. This electrostatic effect can be a nuisance (when dust collects rapidly on plastic phonograph records, for example) but is an asset in the electrostatic precipitator which can remove dust, smoke and vapor from the air or arrange flock in a pattern on a fabric backing.

The Electrostatic Series

Let us now go back to the fundamental principle of generating static electricity. With any two materials it is found, on rubbing them together, that one has become positively charged and the other negatively charged. Let us call the positively charged material "P" and the other "N." If we now test a third material against both of these we may find that "A" becomes positive to both "N" and "P," that "B" becomes negative to both "N" and "P," or that "C" becomes positive to "N" and negative to "P." What will not occur is that "D" will be positive to "P" and negative to "N." In testing more materials, it is found they may be arranged in a vertical series so that any material rubbed against another lower on the list will acquire a positive charge. Conversely, if they are rubbed against a material higher on the list, they will acquire a negative charge.

This electrostatic series is determined by testing various substances against one another in pairs and finding in each test which of the pair is charged positively and which negatively. There are several ways of doing this, all based fundamentally on the definition of an electric charge. A body is said to be charged positively when it has a charge like that which appears on a glass rod rubbed with silk. A body is charged negatively when it possesses a charge like that which appears on a rubber rod rubbed with cat's fur. All nomenclature in electricity is based on these definitions, which predate any conception or theory about the nature of electricity. One might think it a coincidence that a body with an excess of electrons, our modern unit of negative electricity, has a negative charge according to the old definition. The fact is, however, that the electron is negative only because we say it is, and we say it is only because a body with an excess of electrons has the same charge as that which appears on a rubber rod rubbed with cat's fur.

How do these definitions help us determine the sign of the charges on "A" and "B" when they are rubbed together? We make use of the electroscope. This instrument consists of a pair of gold leaves inside a glass jar hanging from a knob at the top of the jar. If we give a negative charge to a rubber rod by rubbing it with cat's fur, and bring the rod near the knob, electrons are repelled into the gold leaves leaving the knob positively charged. With the rubber rod still held near the knob, we touch the knob with a finger so that electrons run from the finger to the knob. If we first remove the finger, then the rubber rod, we leave the whole electroscope negatively charged. The two gold leaves then repel each other, being similarly charged, and stand at an angle from each other. By definition, the charge they received from the rubber rod was a negative charge. Now we may rub "A" and "B" together and bring "A" up to the knob of the electroscope. If "A" is positively charged, part of the negative charge on the leaves and the knob will be neutralized and the leaves drop closer together. If "A" is negatively charged, the charge on the leaves and their separation both increase.

The gold leaf electroscope, which is fragile and qualitative in its indication, may be replaced by more modern instruments which are sturdier and give quantitative indication of the charge being measured. We prefer to use an electrostatic voltmeter. In this instrument the gold leaves are replaced by two light metal plates, one of which is mounted on a sensitive pivot. The repulsion between the plates causes the pivoted one to rotate, carrying with it a needle which indicates the exact magnitude of the charge on a scale calibrated in volts. These instruments are available in various ranges, allowing measurement of electrostatic charges from 30 volts to 5,000 volts. Using this instrument we can set up a charge for comparison with the unknowns, of which we know not only the sign, but the magnitude. For example, if we connect the negative terminal of a "B" battery to the "high" terminal of the voltmeter and the positive of the battery to the "ground" terminal of the voltmeter, we have a 45 volt negative charge on the voltmeter, from which may be determined the sign and the magnitude of any unknown charge.

The electrostatic series that has been deduced from experiments as described above is shown in Table I. What does this series tell us about the electrostatic behavior of various fibers? Our first thought is that when rubbed against a given material, each fiber wil be given a charge of a magnitude related to its separation from that material in the electrostatic series.

TABLE I
Electrostatic Series

Positive End	Ramie
Glass	Steel
Human hair	Hard Rubber
Nylon yarn	Acetate rayon
Nylon polymer	Synthetic rubber
Wool	*"Orlon" acrylic fiber
Silk	Saran
Viscose rayon	Polythene
Cotton	Negative End
Paper	

* "Orlon" is a trade-mark used by du Pont to designate its acrylic fiber.

For example, against rubber, which is near the negative end of the series, we should predict that "Orlon" acrylic fiber would not generate much static, that nylon would be worse than cotton and wool nearly as bad as nylon. These predictions are not borne out by experiment. A series of tests was run on a number of fibers to determine the electrostatic voltage generated against a single material. Ten gram skeins of the fibers were rubbed against a rubber glove by manipulating the skein while wearing the glove, and then the voltage generated was measured by dropping the skein into an aluminum beaker attached to the "high" terminal of the voltmeter. All skeins were boiled off and thoroughly conditioned before testing with all tests performed by the same person. The results are shown in Table II. It is seen that wool generates little static compared with the rest, and that "Orlon" acrylic fiber is very bad where static is concerned.

Clearly, then, other factors must be taken into consideration to explain the relative susceptibility of the different fibers to static. One factor which comes readily to mind is moisture. On any fiber, static is less troublesome at higher humidity. This is partly a result of the quicker dissipation of the charges in more humid air, but it is also true that dry fibers generate much more static than conditioned fibers in the same atmosphere. It is therefore plausible that wool owes its low static susceptibility to its high moisture regain. In Table III, the first column duplicates Table II, showing the experimental order of the fibers according to electrostatic voltage generated. The second column lists the same fibers in order of moisture regain, with highest regain at the top of the list. The third column shows the separation of

TABLE II
Electrostatic Voltages of Various Fibers Against Synthetic Rubber

Fiber	*Voltage*
Cotton	50
Viscose rayon	100
Wool	350
Acetate rayon	550
"Vinyon" N vinyl fiber	800
Silk	850
"Orlon" acrylic fiber	900
Nylon	1050

TABLE III

Order of Electrostatic Susceptibility Against Synthetic Rubber

Experimental	*Predicted from Moisture Regain*	*Predicted from Electrostatic Series*
Cotton	Wool	"Orlon" acrylic fiber
Viscose rayon	Silk	
Wool	Viscose rayon	Acetate rayon
Acetate rayon	Cotton	Cotton
"Vinyon" N vinyl fiber	Acetate rayon	Viscose rayon
Silk	Nylon	Silk
"Orlon" acrylic fiber	"Orlon" acrylic fiber	Wool
Nylon	"Vinyon" N vinyl fiber	Nylon

the fibers from rubber in the electrostatic series. We see from column two that wool has the highest moisture regain of all the fibers, which may acount for the fact that its static propensity is lower than that predicted; and that acrylic fibers have extremely low moisture regain, which may cause greater static propensity than that predicted from the electrostatic series. It must be understood, however, that these two factors do not explain completely all the electrostatic phenomena observed.

Difficulties in Textile Processing

We turn now to some of the specific difficulties met in textile processing which may be attributed to the accumulation of electrostatic charges. Because nylon is one of the worst offenders, it will be used as an example although many of the other fibers show some or all of these same symptoms.

In the very first process in which nylon appears as a filament, the melt-spinning process, static has been troublesome. After its first contact with another material, at the convergence guide below the spinneret, the yarn has sufficient charge to cause ballooning in some cases. If allowed to continue much below the convergence guide, this ballooning could become quite severe and could cause serious troubles, such as loops and undertucks on the spin bobbins.

Static difficulties also occur in the draw-twisting process, in which the unoriented yarn is drawn by elongating several times over a pin. Ballooning may occur before the draw pin, resulting in spreading of the filaments on the pin with consequent filament and end breakage. The ballooning may occur below the draw pin, resulting in loops in the drawtwist package. This condition occurs only rarely in drawing at room temperature, the generation of static usually being prevented by the spin finish normally present on the yarn. However, when heat is applied to the yarn during drawing, the static becomes serious and special antistatic spin finishes must be applied to the yarn so processed. Static also occurs on certain yarn counts during some of the rewinding operations. This is particularly true during spooling in which the yarn is attracted to the metal ends of the spool at the reversals of the traverse, giving spools with bunched ends and undertucks. While static eliminators have been used in some cases, the best remedy is, again, the application of an antistatic finish.

During warping of nylon and other hydrophobic fibers, static causes serious trouble by destroying the alignment of the warp and causing ballooning of the individual ends. The same troubles occur during knitting or weaving from the warp. In weaving, static may also cause poor delivery from the shuttle. In full-fashioned or circular knitting, as well as in the above cases, the effects of static (such as ballooning, running out of guides, clinging to parts of the machine) can cause damage to the yarn and poor formation of the stitch or weave.

The processing of staple is more seriously affected by static than any processing of continuous filament yarn. It is safe to say that under no circumstances could nylon staple be run through any of the processes in any staple system without adequate protection by an antistatic finish. During opening and picking, improperly finished staple will not even leave the machine to form a lap. During carding, the web will completely disintegrate and if it can be persuaded to form a sliver, the sliver will not leave the coiler head nor drop into the can. The same conditions prevail in drawing. The only complete remedy for these troubles is the presence of a sufficient quantity of an antistatic ingredient in the finish, although in borderline cases the troubles may be alleviated by increasing the humidity or by use of static eliminators.

Even when the fabric has been produced, static still causes trouble. When fabrics have to be piled, as in the inspection of hosiery or the folding of woven fabrics, the accumulation of static will sometimes prevent even piling.

Static may cause observable effects in finished garments, as well. Either outer or under garments will occasionally cling to the wearer. It depends on whether one is the wearer or observer as to whether this is an undesirable effect. There are cases where static accumulation on garments can cause sparks.

And finally there is the occurrence of "shocks" when one walks on a wool or nylon rug during dry winter weather.

Remedies for Excessive Static

As mentioned above, borderline processes may sometimes be made operable by increasing the humidity or by use of static eliminators. For example, in nylon staple processing, a relative humidity of 60 to 65 per cent is desirable to prevent static difficulties during opening, carding and drawing. (It should be mentioned, however, that during spinning the relative humidity should be below 50 per cent, because higher humidities at this stage cause high end breakage.) Proper humidity has been the remedy for static troubles in many of the processes with continuous filament yarn as well. Sparks from rugs or garments are seldom observed in a humid atmosphere.

Static eliminators are of two types, one employing radioactive materials and the other, high frequency discharge. Both function in the same way, by ionizing the air and permitting rapid dissipation of the static charges. There are many specific applications of these eliminators. Long bars of the radioactive eliminator or long tubes of the high frequency eliminator may be placed near the calendar rolls of the picker. These bars are also useful when placed over the web on the card. On the drawing machine, shorter bars may be placed over the web, fastened to the front of the clearer covers. The coiler mechanism of both the card and the drawing machine may be equipped with specially shaped attachments for use with the high-frequency system. Small buttons of radioactive foil may be placed very close to the coiler tube on the underside of the coiler head.

Static in warping may be decreased by placing a bar across the warp, nearly touching it. The same method reduces static whenever there is a long run of fabric.

For multiposition rewinding operations, the high-frequency system may be used with a conductor the length of the machine leading the discharge to pointed branches which terminate near the individual yarn paths.

Application of a suitable finish is, however the best method for preventing static difficulties. This universal remedy, however, is not easily attained for several reasons. No one finish or one antistatic ingredient is effective in preventing static in all the various processes to which the fiber will be subjected. In almost all cases the antistatic ingredient so modifies the lubricity of the finish that high backwinding tensions are incurred at some point or other. Furthermore, a yarn or staple which is completely static-free when prepared is

(Concluded on Page P862)

New York Section—

THE CHEMISTRY OF COMMERCIAL PLASTICS*

REGINALD L. WAKEMAN
Director of Research, Onyx Oil & Chemical Co.

IN 1926 a group of electricians were working on high tension lines outside Toronto. One of the men accidentally touched the top of his head to a live wire and was so seriously burned that a physician called to the spot gave him up as dead. His fellow electricians, however, refused to give up hope. After working over him some time they succeeded in resuscitating him. He was rushed to the Toronto General Hospital where a series of intricate operations were performed. At length, it looked as though the electrician might live, but in the course of the accident and the operations which followed, the top of his skull had disappeared. It was necessary to find some material which could be used as an artificial head. A group of specialists was called in for consultation. They considered all of the factors which his head would have to withstand, cold of the Canadian winter, heat of a Canadian summer, and perhaps the accidental fall of an apple from his orchard. It was decided that a phenol-formaldehyde resin should be tried. An appropriate cast was made and from it a very special mold. Finally there was produced a first-class Bakelite head. With appropriate tape to hold it on, and a wig to cover it, the electrician finally left the hospital looking none the worse for wear, and at last reports he was still hale and hearty with his plastic head.

This striking tale emphasizes the diversity of fields which these man-made resins have entered since chemists first explored their possibilities some fifty years ago. The history of the plastics industry has its roots in the development of vulcanized rubber, first produced in 1839 by Charles Goodyear. A few years later his brother Nelson developed hard rubber. During the next twenty years, work was done in different countries to develop resinous materials by transforming cellulose into cellulose nitrate, which was finally converted into Celluloid by John Wesley Hyatt in 1868. Both of these products, vulcanized rubber and cellulose nitrate, are semi-synthetic resins. Nature did most of the work in producing rubber and cellulose, substances which possess very high molecular weight. Then chemists took over and finished the job. Not until the turn of the century did man develop methods for making purely synthetic resinous materials from ordinary chemicals of commerce derived from coal.

Shortly after 1900 a young American chemist of Belgian birth, Baekeland, who had already made a name for himself in the development of Velox photographic paper, reacted phenol with formaldehyde and obtained shellac substitutes. By impregnating woven fabric with these shellac substitutes, and bonding a number of these sheets of impregnated paper under pressure, he developed a laminate which was of value for electrical insulating. Instead of laminating impregnated sheets of material, he found that he could fill the resins with such materials as wood pulp, clays or chopped fabric, and mold a great variety of articles under heat and pressure.

From these early discoveries has come a continuous procession of synthetic resins and plastics, expanded by leaps and bounds during the past two decades.

As new resins have been developed and new applications found for them, plastics have left the field of gadgets and taken their place as engineering materials in their own right. They should not properly be considered substitutes. The most fruitful applications of synthetic resins have come from combinations of properties which can be built into these man-made materials but not found combined in the same way among natural products. For example, the methacrylates are even more transparent than glass, but are shatter resistant. Polystyrene can be readily molded, yet possesses dielectric properties equal to those of quartz. Copolymers of butadiene and acrylonitrile are as elastic as natural rubber, but are highly solvent resistant and not affected by elevated temperatures.

Because of the unique combinations of properties in various plastics, these materials have found uses unknown to those not intimately familiar with the industry. Resinous materials produced by reaction of cashew nut shell oil with formaldehyde find use in manufacture of brake linings. Resinous materials produced by the polymerization of isobutylene are of value in the production of bullet-proof airplane tanks. Phenol-formaldehyde condensation products are used in the cement of light bulb bases and in bonding emery wheels. Resinous materials made by chlorinating diphenyl are of value in transformer oils. Without the remarkable dielectric properties of polystyrene, television would be impractical. One of the newest plastics, polytetrafluoroethylene, can be fabricated into gaskets for chemical equipment which will withstand extreme temperatures and be attacked only by molten sodium. Synthetic resins for crush-proofing and other textile finishing purposes impart to fabrics properties highly desired by the consumer, who is less aware of the utility of resins in this field than are the members of this audience.

It is our purpose this evening to review the types of resins available, and their applications. Their use in the textile industry has become as remarkable an achievement of industrial organic

* Presented at meeting, New York Section, September 23, 1949.

chemistry in the 20th Century as was the development of dyestuffs in the 19th.

What is a synthetic resin? Perhaps the simplest definition is that it is a synthetic material composed of mixtures of extremely large molecules which may contain from fifty up to tens of thousands of individual atoms. Synthetic resins are produced by joining simple molecules to make very large molecules, some almost visible under the electron microscope. By suitable catalytic operations, for example, one of the simplest organic compounds, ethylene, containing two carbons and four hydrogens, can be polymerized to a resinous material in which hundreds, and perhaps thousands, of carbon atoms are united in a single molecule.

General Classes

To have some understanding of the chemistry and technology of these high molecular weight synthetic resins it is necessary to differentiate one general class from another. Literally thousands of these materials have been made experimentally and there are probably several hundred of them on the American market today. It is possible to divide these substances into three principal groups, although there may be some overlapping from one group to another. Most resins are either thermosetting or thermoplastic. Some of them are chemosetting. A thermosetting resin is one usually sold in such form that it will melt or soften upon heating but on continued application of heat will further resinify and become a hard, solid material while still hot. In this final form it can not be melted or softened again by application of heat. In other words it has been thermally set. A thermoplastic resin, on the other hand, will melt or soften upon heating, and remain in this condition until cooled, when it reverts to its initial state. This softening by the application of heat can be repeated as many times as desired. A chemosetting resin is converted to its final stage of resinification by reaction with some extraneous chemical not present in the intermediate resinous molecule. Most phenol-formaldehyde resins are of the thermosetting category. The intermediate resinous material can be softened by application of heat. If heating is continued, usually with application of pressure, a hard mass is obtained, familiar in the form of molded electrical fixtures, door knobs, ash trays, radio cabinets and telephone hand sets. Cellulose nitrate, cellulose acetate and most of the vinyl resins are typical examples of thermoplastic materials which can be softened by heat as many times as one wishes. Natural and synthetic rubbers are characteristic chemosetting resins in that they are cured to their final stage by heating with some vulcanizing material, usually sulfur.

It is of interest to note the chemcial difference between thermosetting and thermoplastic resins. Fundamentally it lies in the architecture of the molecules. It can be illustrated by comparing a flag pole with a house. The molecule of a thermoplastic is linear like a flag pole. While the latter sways in the wind and is susceptible to the vibrations of the ground upon which it rests, so also the linear molecule of a thermoplastic resin is susceptible to forces brought to bear upon it, for example heat. Being much smaller and less rigid than a flag pole, it can change its orientation, and it may curl up or straighten out under the effect of various mechanical treatments. These linear thermoplastic molecules usually possess carbon skeletons in which the various carbon atoms are joined, one after the other, in Indian file. In some cases, as in nylon, the carbon chains may be interrupted by atoms of other elements such as nitrogen. Thermoset resins on the other hand have molecular skeletons more resembling the interlocked structure of a steel building. The carbon and other atoms are not connected simply in a straight line, but are interlocked to form a compact network, much less subject to the jolts which the molecule receives from such forces as heat. As a building is less affected by wind than a flag pole, so the interlocked, or "cross-linked" molecule of a thermoset resin is less affected by heat than a linear thermoplastic one.

There are in general two ways in which these high molecular weight resins may be formed. Most thermosetting resins, and some of the thermoplastics, are produced by splitting out water or some other simple substance through reaction between two or more relatively low molecular weight chemicals. This process is known as condensation and the products are sometimes called condensation polymers. Most thermoplastics, and some thermosetting resins, result from addition of many molecules to each other across unsaturated groups present in the monomeric, that is to say low molecular weight, materials from which the resins are formed. In such cases, no water or other chemical is split out during reaction and the products are called addition polymers.

The classification of synthetic and semi-synthetic resins according to their molecular architecture is not only of theoretical interest but also very important practically, because it determines the way a particular resin must be handled by the user to convert it to its ultimate form. This is no less true in textile use of resins than in any other. Urea-formaldehyde resins, for example, belong to the general category of thermosetting materials, and when applied to textiles in a sufficiently low stage of molecular condensation for crush-proofing they have to be cured or set in the presence of catalysts with heat to convert them to the final fully condensed forms. These impart crease-resistance to cellulosic fabrics. On the other hand, aqueous emulsions of thermoplastic resins applied to fabrics to modify their hand are not altered by heating. Yet again, if a fabric is to be coated with rubber or neoprene, the resinous coating has to be set by chemical curing, with sulfur in the case of rubber, or a metallic oxide, for example, in the case of neoprene.

Thermosetting Types

Having considered classification of resinous materials, let us discuss the various chemical representatives of each class. Among the thermosetting resins the oldest family is that of the phenol-formaldehyde condensation products. Phenolic resins, usually filled with wood flour, asbestos, chopped fabric or some other material, can be molded under the application of heat and pressure into a very wide diversity of consumer items. Parts of electrical instruments, telephonic equipment, bottle caps, instrument cases, and even cash register drawers represent a few of the many objects molded from phenolics. Perhaps the largest individual item ever made from a phenolic resin, molded under heat and high pressure, is a casket produced in England. It is not easy to extrude a thermosetting material, because the curing has to be done during the extrusion operation; but within the past few years methods have been developed, particularly abroad, for the manufacture of rods and tubes by such a process.

Certain modified forms of phenolic resins can be cast in rubber-lined plaster of Paris molds. In such cases, of course, no pressure is applied. Moderate heating is used for curing, which extends over a much greater time than for molded articles. Most cast phenolics are utilized for semi-decorative purposes such as buttons, buckles and knife handles. Because of the relatively low temperatures employed for curing in the absence of pressure, brilliant colors can be imparted to these materials by proper selection of dyes and pigments. In general, however, the physical properties of cast phenolics are not as desirable as those of molded materials, because curing continues over an extended period of time

even after the article is removed from the form. Miscellaneous ways in which phenolics are utilized include surface coating materials, adhesives and ion-exchange resins. Solutions of various phenolics are also used extensively for impregnation of paper, textiles and asbestos sheeting as well as glass fabrics. Many layers of these impregnated sheets are bonded under heat and pressure to give laminated phenolics widely used in structural and insulating applications.

Another important chemical class of thermosetting resins is that of urea-formaldehyde condensation products. These behave in much the same manner as phenolics and have similar applications. They have one marked advantage over phenolic resins, their lightness in color. In molded form they are available in a variety of white and pastel shades and for this reason find considerable use in electric light shades and reflectors. White or light colored butcher scale housings, meat grinder housings and fittings for many home applainces are molded out of urea-formaldehyde resins. One interesting and very important use of these materials is in the adhesive field. They are particularly valuable in woodworking. Much resin-bonded plywood, particularly for the aircraft industry, is manufactured with urea-formaldehyde resin adhesives.

Urea-formaldehyde resins have rather unique behaviour in combination with cellulosic materials. Wood pulp is often used as a filler for molding urea-formaldehyde resins, but if the molded plastic, after curing, is cut and examined under the microscope, the individual cellulosic fibers can not be distinguished. Urea resins differ in this respect from phenolics, in which wood fiber fillers can be seen under sufficiently high magnification of a cut surface. Perhaps in part because of this characteristic, urea-formaldehyde resins have shown outstanding utility in the textile field for crush-proofing rayon and other cellulosics. When fabric is treated with an aqueous solution of urea-formaldehyde resin in sufficiently low degree of condensation, intermediate resin molecules appear to penetrate the fiber and become more or less chemically associated with it. Upon curing with heat in the presence of a suitable catalyst, the resin which has impregnated the fiber resinifies further, and imparts to treated goods the resistance to creasing which during the past few years has become so familiar in crush-proofed fabrics.

Melamine can be used instead of urea in the production of light colored thermosetting resins. Though these have taken their place with the phenolics and ureas as members of this general class, they have not gained the same favor as urea-formaldehyde resins, one of the principal reasons being their greater price.

Another interesting group of thermosetting resins is that of the alkyds. There are many different kinds of alkyds; most of them are thermosetting, a few of them are thermoplastic, and some representatives of this class breach the gap between thermosetting and thermoplastic materials, showing characteristics of both. These materials are made by reacting phthalic anhydride, maleic anhydride or one of their analogues with glycerol, ethylene glycol, pentaerythritol or similar material. They can be modified by incorporation of fatty acids including non-drying, semi-drying and drying acids, or by reacting into their molecules rosin, phenolic resins or urea resins. The greatest use of the alkyds is in surface coatings. In some cases these coatings are cured by baking, in other instances they are chemically cured by reaction of atmospheric oxygen with the drying oil portions of their molecules. Alkyds are also used to some extent as adhesives, one of their earliest applications being in pasting pieces of mica together to make an inexpensive substitute for sheet mica. During the war there were developed certain alkyds which exhibited rubber-like properties and were used as rubber replacements. An interesting application in the textile field is in ribbon finish. Certain alkyds, converted into water soluble forms and applied to acetate fabrics, yield a stiffness and luster which the ribbon trade seeks. This type of resin is also serviceable as a general acetate finish, for it does not mark off and does not affect luster.

Thermoplastics

The resins just discussed represent the principal chemical families among thermosetting resins. Let us now direct our attention to the second major group, thermoplastics. Many developments in this field are more recent than in thermosetting plastics. The various vinyl resins, which today are important representatives of thermoplastics, were only beginning to be developed as commercial products before World War II. Among currently important vinyls the majority are made from vinyl chloride and vinyl acetate. Both of these basic materials can be produced from either ethylene or acetylene. Practically all vinyl acetate is made from the latter. Vinyl chloride is made from both hydrocarbons. Thus it will be seen that either coal or petroleum may be the raw material. In production of resins from these monomeric substances, polymerization is carried out by means of a suitable catalyst, usually a peroxide of some kind. During this reaction the low boiling liquid monomer is converted into a very high polymer. Polymerization may be carried out in a solvent or in an aqueous emulsion, or the monomer may be dispersed in water in the form of beads, in which case the final physical form of the resin is granular. Vinyl resins are produced in a wide variety of chemical modifications. Not only are vinyl acetate and vinyl chloride used as the principal monomers, but other unsaturated chemicals which can be reacted into the resin molecules are frequently used with them. Vinyl ethers have recently become industrially available. Moreover, the acetate groupings in polyvinyl acetate can be saponified and replaced by alcohol groups. They can also be replaced by various other organic linkages such as acetal configurations. Polyvinyl acetate is now used extensively in adhesive formulations and in paper coatings. Various modifications of vinyl resins in emulsion form are gaining wide acceptance in the textile industry. Depending upon the particular formulation of the resin and upon the other finishing materials used in the treating bath, these emulsions can be employed to give a wide variety of hand. They are particularly useful in building up of body and development of stiffness. The amount of stiffening which can be imparted to ninon or marquisette by treatment with a relatively small amount of these materials is quite spectacular.

Straight polyvinyl chloride does not lend itself to the finishing of textiles, although it is used to some extent as a coating material. When a suitable plasticizer is incorporated in polyvinyl chloride it can be made into a flexible, more or less elastic mass, and this product has been widely used in recent years as a liner for chemical conduits, flexible tubing and hose, electrical insulation, flexible sheeting and coating material for water-proof blankets and drapes. Polyvinyl chloride is non-flammable and for this reason has found some application in the coating of canvas for tenting and awning.

Curiously, polyvinyl acetate and polyvinyl chloride are not compatible with each other, but the two monomers can be mixed and polymerized together. The product is a so-called vinyl chloride-acetate copolymer possessing properties intermediate between those of polyvinyl acetate and polyvinyl chloride. Its properties can be varied one way or the other through the ratio of monomers. Copolymers containing a high percentage of vinyl chloride possess many of the physical properties of polyvinyl chloride.

They are easier to handle mechanically, being readily extruded or injection molded. They are more readily plasticized than polyvinyl chloride and are also more soluble. Interesting developments in textile resins in recent years are the so-called organosols and plastisols. In the latter, vinyl resin in powder form is mixed with sufficient plasticizer to yield the required flexibility. Resin and plasticizer are so chosen that at room temperature the mixture is a heavy paste which can be spread on a textile or any other surface. By raising the temperature sufficiently, the mechanical mixture can be converted into a solution of the plasticizer in the resin, so that the surface treated is coated with a flexible plasticized vinyl film.

If polyvinyl acetate is hydrolyzed, it is converted into polyvinyl alcohol. This material can not be produced by polymerizing vinyl alcohol because the latter compound does not exist. It is expensive to make polyvinyl alcohol because about one half of the weight of the polyvinyl acetate is lost as acetic acid during the operation. Polyvinyl alcohol is very soluble in water but very insoluble in most oils. It has therefore been used in tubing, gloves, aprons and other equipment where grease or oil resistance is important and where water will not be encountered. In the form of sheeting, polyvinyl alcohol has been used as a liner for molds in the casting of certain other types of synthetic resins. One of its most important uses has been in the textile field. It is the principal ingredient of PM 90 where it is dissolved in water and combined with boric acid. In this form it has served an important function as a size in the throwing of nylon yarn. By appropriate reaction with various aldehydes, either polyvinyl alcohol or polyvinyl acetate can be converted into an acetal type of resin. The most important representative of this class is polyvinyl butyral made from butyraldehyde. When suitably plasticized, this resin can be sheeted into a flexible transparent film widely used as the interlayer in safety glass. For this purpose it has completely replaced the cellulose acetate and cellulose nitrate used in the early days of the industry.

Another monomer known as vinylidine chloride is similar to vinyl chloride except that it contains twice as much chlorine. This product can also be polymerized and yields a non-flammable, oil- and perspiration-resistant resin which today is well-known under the trade name, Saran. It is extruded in the form of pipe and tubing and injection molded into various articles where oil resistance is particularly important. It has met with considerable application in the form of extruded rattan and monofilaments of many sizes for woven upholstery material and screening.

One of the earliest thermoplastic resins was of the polyacrylate type. Many years passed, however, before the acrylates became commercial articles. This was partly because of difficulty in handling the polymerization, but probably more because of unavailability of chemical intermediates required and difficulty in producing these compounds prior to the remarkable development of aliphatic chemicals from petroleum and coal. Many different types of acrylates are now made. Methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, isopropyl methacrylate, isobutyl and butyl methacrylates, and lauryl methacrylate are the most important monomers used today, either alone or in various combinations. The best known development in the acrylate field, which accounted for considerable expansion during the war, has been production of crystal-clear, shatter-resistant rods, tubes and sheets. Because of the thermoplastic character of these plastics, sheets can be shaped over a form at sufficiently high temperature. Domes and windows so shaped are now commonplace in airplanes. In the production of sheets, rods and tubes the acrylates or methacrylates are cast by polymerizing the monomer, which is mixed with requisite amounts of plasticizer and polymerization catalyst but without solvent of any kind. It is also possible to polymerize the acrylates in aqueous emulsion. Thus several representatives of this family have found use in textile finishing and in leather and paper coating.

There is another important family of thermoplastics derived from a monomer practically unknown commercially until the middle of the last decade; namely styrene. Although polystyrene is one of the resins longest known in the laboratory, having been made experimentally about 1831, it became available as an industrial product in this country less than twenty years ago. Even then the process developed for the manufacture of the basic material, styrene, was so unsatisfactory that polystyrene sold for $1.50 to $2.00 a pound and it was yellowish in color. The first use on the American market proved short-lived because it was in production of dentures. This proved a poor selection, for in use the dentures broke; so polystyrene disappeared from the market. Within a few years other methods of making styrene were developed by both the chemical and petroleum industries. During the war large volumes of this material were utilized in manufacture of synthetic rubber. The efficiencies and economies introduced through the synthetic rubber program have led to polystyrene becoming one of the least expensive synthetic resins available. In molded form it has proved of great value in electrical parts. Its dielectric characteristics are equally as good as those of fused quartz. It has also found electrical insulating application in the form of film. Uses of this inexpensive material in molded goods such as bottle caps and housings, combs and other small items have become commonplace. Styrene can also be modified with other monomeric materials. Polymers made from styrene are finding application in the textile field. It should be noted in this case, as with the vinyl resins and indeed with all the new resin emulsions used in the textile industry, that the character of emulsions and the properties which these impart to textile materials, can be made to vary widely even with a single chemical such as styrene or vinyl acetate as the major intermediate. The properties of resin emulsions depend not only upon the chemical nature of the intermediate but also upon the extent to which it is polymerized. Some polystyrenes, for example, may have as few as ten styrene molecules in a single polymeric molecule, while highly polymerized material may have five thousand or more styrene molecules linked together in a single molecule of polymer. Between the largest and the smallest there are vast numbers of intermediates, and the characteristics of the resin may be altered greatly by varying its molecular weight. In an aqueous dispersion of synthetic resin we are dealing with a system markedly different from a solution, in that it possesses colloidal characteristics. In a true solution, individual molecules of solute are separated by many molecules of solvent, the system being a true molecular dispersion. But in a colloidal resin dispersion the individual particles are by no means of molecular size. They are agglomerates of many molecules, and these agglomerates or particles are held in suspension as the result of an electrical charge on each one. The characteristics of the resin emulsion may be made to vary widely according to the size of these individual particles dispersed in the mass. If particle size is sufficiently small the dispersion may be almost water clear. As particle size increases the dispersion acquires a milky appearance, and with larger particle size opacity is still further increased. The characteristics of a resin as laid down from emulsions of varying particle size differ extensively. Another factor affecting the characteristics of a resin emulsion is the emulsifying agent

employed in its preparation. The preparation of a resin emulsion not only involves a considerable amount of advanced chemical knowledge but it is also a bit of an art. While only a single surface active material may at times be employed in the preparation of a resin dispersion, it is not uncommon for a half dozen or more materials to be used. The properties and usefulness of the final resin dispersion vary markedly with the kinds and amounts of emulsifying agents present, as well as with their anionic, nonionic, or cationic character.

Not only are the properties of resin dispersions dependent upon the fundamental chemical nature of the monomer employed, the molecular weight of the resin produced, the particle size of the dispersion, and the character and quantity of emulsifying agents; but also the presence of modifying monomeric materials may make a vast difference in the performance of the dispersion. Polystyrene, for example, can be produced in the form of a resin dispersion of relatively large particle size, which upon evaporation of water from a cast film yields a more or less pulverulent mass, insoluble in water. On the other hand, styrene may be copolymerized with maleic anhydride, and the resulting copolymer, instead of being immune to the action of water, can be dissolved in caustic soda to yield a perfectly clear solution, which has been used in warp sizing in place of gelatin or other natural materials.

It is curious that the simplest unsaturated organic compound, ethylene, was not converted to a polymer for many years after the synthetic resin and plastics industry had developed. Toward the end of the war polyethylene became an important material for cable coating, particularly in the development of radar. Since the war, polyethylene has expanded considerably in commercial importance, and one of its most interesting applications today is in the form of flexible bag liners for chemical containers. Sheets, and extruded and injection molded articles are becoming commonplace. This material is of particular interest because it is substantially the same as a very high molecular weight paraffin wax; it possesses all the chemical inertness with which we are familiar in paraffin.

Although no particular merit attaches to them as far as the textile industry is concerned (at least, no textile use has as yet developed), it is interesting to note that one of the most recent trends in the development of synthetic resins and plastics has been the introduction of fluorine into resin molecules. The first product of this kind was announced about two years ago, although it was used to some extent for military purposes toward the end of the war. This material is polytetrafluoroethylene. It is unique in its fire-resistance, for it can be held in a burning flame without ignition and, for short periods, without appreciable physical modification. Its flexibility is relatively unaffected by variation of temperature throughout a wide range. Very recently other resins have been developed which contain both chlorine and fluorine in the molecule.

This brief review summarizes some of the more important developments in the field of synthetic resins and plastics. Numerous other products have been developed and are being pushed with vigor today. One unique material which might be mentioned in passing is polyvinyl pyrrolidone. This substance, soluble in both water and organic solvents, is remarkable in that it exhibits physiological characteristics which appear equivalent to those of blood serum. It was developed during the war, and over 300,000 units were administered to German soldiers in the treatment of shock. Apparently these treatments were successful. This perhaps is one of the closest approaches man has made to the secrets of life itself.

Developments

It is unnecessary to point out to a textile group the important developments in synthetic resins which have occurred in production of synthetic and semi-synthetic fibers. Viscose rayon itself is a semi-synthetic resin, produced by saponification of cellulose xanthate. Cellulose acetate is a semi-synthetic plastic and Fortisan is obtained by its hydrolysis. Vinyon CF is a purely synthetic resin, being a vinyl chloride-acetate copolymer, and the new textile, Vinyon N, currently being developed, is also a purely synthetic copolymer of vinyl chloride and acrylonitrile. Orlon is a purely synthetic resin obtained by polymerization of acrylonitrile. Nylon, now so well-known to the trade, is also a purely synthetic product. It is interesting to notice that the intermediates for the production of nylon have recently been made from furfural, which can be obtained from corn cobs, oat hulls, or cottonseed hull bran. When nylon was first placed on the market much was made of the fact that it was a fiber derived from coal. According to the *New Yorker*, one of the early shoppers in a New York department store asked a sales girl for a pair of nylon stockings made from hard coal instead of soft coal because she thought they ought to wear longer. The development of synthetic resins is probably still only in its infancy, yet during the last several years there has been a remarkable expansion in the use of these materials by the textile industry. The case of urea and melamine resins is an interesting illustration. Out of a total production of about 54,000,000 pounds for the first five months in 1949, over 10,000,000 pounds were used in treatment of textiles and paper. Likewise in the vinyl family, during the first five months of 1949, approximately 12,000,000 pounds out of a total production of about 108,000,000 pounds went into textiles and paper. It is logical to look for much more rapid advance in the combination of synthetic resins with textiles than in other uses because this has been one of the most rapidly developing fields during the past decade.

Discussion

Question: I want to ask what tests Dr. Wakeman uses for the dry-out or cracking properties of plastic films containing plasticizer.

Dr. Wakeman: That is quite a trick because to my knowledge there are nothing but empirical methods for determining the extent to which a film will dry out or crack. In general the best way is to spread a solution of the resin on a plate of glass with an instrument which will give definite thickness of film; then dry under constant conditions and see what happens after a period of conditioning. You have also blooming and orange peel effects which are extremely important. These have to be regulated by varying the proportions and types of plasticizers and solvents in such manner that the evaporation of a quickly evaporating material is balanced by the evaporation of a much slower one.

Question: I am thinking more of the transparent films used for raincoats, or vinyl chloride.

Dr. Wakeman: These generally are tested by conditioning in an oven at a slightly elevated temperature, then bending over a certain radius observing how sharply the film can be bent without developing a crack, or how many times it can be bent. Frequently loss of plasticizer, and possible development of a crack, can be determined by measuring the flexibility of the film with a flexometer.

Question: Some have used the Fadeometer, 80 to 100 hours, for a test. I wonder if that is fairly satisfactory.

Dr. Wakeman: Vinyl resins of this type, in transparent film, are affected by three factors in aging. One is heat, the second light, and the third loss of plasticizer. Loss of plasticizer is hastened by heat, and also by leaching with water. In thorough evaluation of such a film one should measure the plasticizer lost in heating, by weight or determination of flexibility, and

(Concluded on Page P862)

TREASURER'S REPORT

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS
STATEMENT SUMMARIZING RECEIPTS AND DISBURSEMENTS FOR THE YEAR ENDING JULY 31, 1949

		Allocation of Funds									
			Special Research Projects								
	Total	*General Research*	*International Salt Company*	*Association of American Soap and Glycerine Producers*	*Flammability Project*	*U. S. Army Quartermaster Corps (Note A)*	*U. S. Army Chemical Warfare Service (Note B)*	*American Viscose Co. Scholarship Fund*	*Olney Medal Fund*	*Merchandise*	*General*
Receipts:											
Membership dues:											
Corporate memberships	$ 44,410.00	$ 42,145.00	...	$...	$ ...	$ ...	$ ...	$ ...	$ ...	$ ...	$ 2,265.00
Sustaining memberships	597.50	597.50	...								
Senior, Junior, Associate and Student Memberships	41,346.50	...	...	...	...	...	...	...	...	...	41,346.50
Total membership dues	$ 86,354.00	$ 42,742.50	...	...	$ ...	$ ...	...	$ ...	$ ...	$ ...	$43,611.50
American Viscose Company—scholarship donation	1,500.00	...	...	...	...	...	...	1,500.00	...	...	...
Annual meeting registrations—net amount received from Southeastern Section	620.30	...	...	...	...	...	...	...	...	...	620.30
Dividends and interest received	2,659.60	1,367.00	...	...	...	...	...	...	292.60	...	1,000.00
Miscellaneous income, per accompanying schedule	13,839.98	899.67	...	...	...	...	...	...	...	12,940.31	...
Special research projects	6,478.38	...	...	...	4,000.00	2,478.38	...				
Total receipts	$111,452.26	$ 45,009.17	...	...	$4,000.00	$2,478.38	...	$1,500.00	$ 292.60	$12,940.31	$45,231.80
Disbursements:											
Research salaries and expenses	$ 41,702.18	$ 36,738.21	$2,195.76	...	$1,296.37	...	$1,471.84	$ ...	$ ...	$ ...	$ ...
Howes Publishing Company—Subscriptions to American Dyestuff Reporter	15,089.38	...	...	...	...	...	...	...	...	75.00	15,014.38
Disbursements for account of American Viscose Company scholarship	666.52	...	...	...	...	...	...	666.52	...	...	...
Disbursements for account of Olney Medal Fund	182.56	...	...	...	...	...	...	...	182.56	...	...
Secretary's expenses, clerical assistance, etc.	17,153.62	...	...	...	...	...	...	...	...	5,471.62	11,682.00
Printing, etc.	303.00	...	...	...	...	...	...	...	...	48.50	254.50
Publicity	228.78	169.67	...	...	...	...	...	...	...	...	59.11
Merchandise purchases and expenses	7,224.59	...	...	...	...	...	...	...	...	7,224.59	...
Audit of treasurer's and secretary's accounts	300.00	...	...	...	...	...	...	...	...	...	300.00
Section membership allowances	1,840.97	...	...	...	...	...	...	...	...	...	1,840.97
Trade association dues	135.00	...	...	...	...	...	...	...	...	...	135.00
Bonds for treasurer and secretary	80.00	...	...	...	...	...	...	...	...	...	80.00
Other general expenses	1,764.46	...	...	...	...	...	...	...	...	...	1,764.46
Total disbursements	$ 86,671.06	$ 36,907.88	$2,195.76	...	$1,296.37	...	$1,471.84	$ 666.52	$ 182.56	$12,819.71	$31,130.42
Excess (deficiency) of receipts over disbursements	$ 24,781.20	$ 8,101.29	($2,195.76)	$...	$2,703.63	$2,478.38	($1,471.84)	$ 833.48	$ 110.04	$ 120.60	$14,101.38
Inter-fund transfer and adjustment	...	232.51	...	(238.30)	...	5.79	...	...	...	...	...
Cash in banks, advance expense funds and investments (at cost), July 31, 1948	185,402.79	93,373.38	2,195.76	238.30	...	(2,484.17)	(2,389.68)	591.29	5,555.01	8,911.66	79,411.24
Cash in banks, advance expense fund and investments (at cost), July 31, 1949	$210,183.99	$101,707.18	$ ...	$...	$2,703.63	$ ...	($3,861.52)	$1,424.77	$5,665.05	$ 9,032.26	$93,512.62

Summary of cash in banks, advance expense fund and investments at July 31, 1949:

Cash in banks	$113,660.91
Advance expense fund	300.00
United States Savings Bonds, Series F (value at maturity, $40,000; redemption value at July 31, 1949, $34,050), at cost	29,600.00
United States Savings Bonds, Series G, (face value $20,000; redemption value at July 31, 1949, $19,020), at cost	20,000.00
$10,000 United States Treasury Bonds 2½% 1967-72 at cost (value based on market quotations July 31, 1949, $10,230)	10,017.68
Other marketable securities, at cost (value based on market quotations July 31, 1949, $32,662)	36,605.40
	$210,183.99

Notes:

A. During the year ending July 31, 1949 the Association was reimbursed by the U. S. Government for salaries and expenses charged to the research project for the U. S. Army Quartermaster Corps in the previous fiscal year.

B. The balance of $3,861.52 shown above as a deficiency of receipts over disbursements for the research project for the U. S. Army Chemical Warfare Service represents salaries and expenses which had not been reimbursed by the U. S. Government as at July 31, 1949 under the contract covering this project.

Respectfully submitted,
W. R. MOORHOUSE, Treasurer
American Association of Textile Chemists and Colorists.

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

SCHEDULE OF MISCELLANEOUS INCOME FOR THE YEAR ENDING JULY 31, 1949

Miscellaneous income:

Research:		
Launder-Ometer royalties	$ 485.00	
Proceeds from sale of certain office equipment	175.00	
Reimbursement for one-half cost of rain tester from National Association of Wool Manufacturers	130.00	
Reimbursement from U. S. Army Quartermaster Corps for expense of moving equipment	100.90	
Fire insurance rebate	8.77	$ 899.67
Merchandise sales, etc.:		
Multi-fibre cloth royalties	$ 265.37	
Yearbooks	4,464.12	
Dye standards	-367.70	
Knitted tubing	294.00	
Dyestuff Reporters and reprints	392.49	
Crock-meter cloth	1,344.11	
Crock meters	2,571.00	
Moth cloth	570.33	
Rain tester royalties	36.59	
Water-test apparatus	532.25	
Gas fading units	274.96	
Color transference charts	316.00	
Analytical methods	24.50	
Buttons	42.50	
Color index charts	1,350.00	
Dry cleaning unit	3.00	
Chemical Warfare Service cloth sold	91.39	12,940.31
Total miscellaneous income		$13,839.98

AUDITOR'S REPORT

To the Members of the
American Association of Textile
Chemists and Colorists:

We have made an examination of the accompanying statement and supporting schedule summarizing the receipts and disbursements of the treasurer and secretary of the American Association of Textile Chemists and Colorists for the year ending July 31, 1949. In connection therewith, we examined or tested the cashbooks and other records supporting the receipts and disbursements, by methods and to the extent we deemed appropriate, but we did not communicate with the members to confirm the amount of recorded receipts from dues and subscriptions.

In our opinion, the accompanying statement, together with the supporting schedule, fairly summarizes the recorded receipts and disbursements of the association for the year ending July 31, 1949 and the balances of cash in banks, advance expense funds and securities owned as of that date.

Price, Waterhouse & Co.
Boston, Massachusetts
September 30, 1949.

Static—

(Concluded from Page P855)

often found susceptible to static after a long period of storage. A finish on the yarn is not the remedy for static on the fabric because there has not as yet been found an antistatic compound fast to washing.

Many antistatic compounds are known and the use of these in finishes has eliminated many static problems, particularly that on nylon staple.

Many of these compounds fall into two main classes, while others are not so readily classifiable. The first group comprises cationic surface-active substances. These would appear to owe their antistatic effect to the formation of a conducting film on the fiber which carries the static charges away from the point of generation. Inorganic salts act in a similar manner, although they are not surface-active. There are many disadvantages to the use of inorganic salts as textile finishes such as danger of corrosion, dusting when dry, bad effect on hand of yarn and fabric, etc. Quaternary ammonium salts have good antistatic properties; CTAB, (cetyl trimethyl ammonium bromide), is one of the most effective, although many others have nearly as much effect. Other less easily classifiable cation-active substances are represented by "Avitex" R, the Onyxsans, Stanteosine, Appramine, Ahco 111 B and others.

The second large group comprises compounds which contain the polyethylene glycol chain. Among the many different sub-groups in this class are fatty acid esters of polyethylene glycol and reaction products of ethylene oxide with fatty alcohols, with alkyl phenols, and with esters of polyhydric alcohols. Polyethylene glycol itself is a fairly good antistatic, although not as effective as many of its derivatives.

We have found a number of antistatics which could not be classified in either of these groups, in some cases because the material was a proprietory product of unknown composition.

Antistatics may be applied in several ways and at several places. For continuous filament nylon the obvious method of application is spin finish immediately after extrusion. However, for some nylon yarns the antistatic ingredient may be detrimental to the drawtwisting operation which follows spinning. For prevention of static in subsequent operations, antistatic compounds may be incorporated in coning oil.

We have found that sufficient finish cannot be applied at spinning to yarn destined to become staple. In this case a second application is made during the drawing operation. On many occasions a troublesome staple has been rendered static-free by spraying with an antistatic finish. For small test samples we have applied finish by immersion of the staple. This method is very convenient for wet-spun or wet-processed staples, but is not used for nylon because of the drying required.

Antistatic finishes may be applied to fabrics in many convenient ways. It is most helpful if the softening finish is also antistatic, as is the case with "Avitex" R.

It has been found that rugs may be sprayed with antistatic finishes to prevent the sparks which sometimes occur.

In general, the manufacturer of the fiber attempts to turn out a product which is static-free. In the case of nylon, various finishes are used and even then not all the static problems are solved. However, much research effort is being spent to solve the problem with the not impossible, nor even improbable, goal of developing a universal, permanent antistatic finish.

—♦ ♦—

Commercial Plastics—

(Concluded from Page P860)

the amount lost in water extraction at room temperature and at a slightly elevated temperature. But one should determine also the discoloration and cracking under heat alone, and discoloration under ultraviolet light. In other words, the Fadeometer will not give you the whole answer because of the other two factors involved. The Fade-Ometer will accelerate decomposition of the chloride portion of the molecule. If possible, the resin should be stabilized. This can be done by adding dibutyl tin laurate or dibutyl tin maleate. Then you don't get much cracking and discoloration under the Fade-Ometer or upon heating, but you are likely still to lose plasticizer unless this be very carefully selected.

Annual Banquet Session—

FREEDOM IN ACTION*

MORRIS SAYRE

President, Corn Products Refining Company, New York City, and Chairman of the Board, National Association of Manufacturers

ONE of the wisest things Lincoln ever said was that you can fool all of the people some of the time, and some of the people all of the time, but you can't fool all of the people all of the time. A few years ago practically all the people were momentarily fooled (or at least confused) by an emotional catch phrase about four freedoms: freedom of speech, freedom of religion, freedom from want and freedom from fear. It sounded good and for a while great numbers of people were lulled into the belief that these four freedoms comprised the sum-total of freedom. But, as Lincoln said, you can't fool all of the people all of the time. Especially the American people and particularly about freedom!

Gentlemen, we have been gradually coming out of the ether administered by political quacks. We are coming back to recognition of the freedom conceived, fought for and won by our forefathers; that precious freedom every American inherits—inherits to use, protect and, more important, to leave in trust to future generations. It isn't four, or eight or twelve freedoms. It is, rather, just one all-embracing, all-inclusive freedom. It is freedom limited only by the requirement that its exercise shall not violate the freedom of others, and a part of this freedom is the right of all men to engage in free, competitive, individual enterprise.

All of us will agree that a man should have an undisputed right and complete freedom to work at whatever he chooses and where and when he pleases. Call it whatever you will—free enterprise, competitive enterprise or individual enterprise. That right of individual enterprise is the keystone of the American arch of freedom.

But let's take a look at those so-called "four freedoms". Of its own absurdity I would like to point out several of its contradictions. Freedom of speech and of religion—the first two freedoms—are, of course, endorsed and believed in by all free men as active, integral parts of American freedom. But freedom *from* want and *from* fear—the third and fourth freedoms are *passive*. You will notice that they are not "of," but "from." Note too, the quite different use of the word "free". These aren't really freedoms at all. They are nothing more than the age old familiar political promises to make everyone free of want. It's a promise that the government not only guarantees to end poverty but pledges itself to fulfill all our needs and desires.

Government can do no such thing! But it can pretend that the fulfillment of such a promise requires it be given unlimited authority over a nation's life. This, of course, is the real objective and it isn't freedom. Once that objective is achieved, government will only have freed everyone *from* the *hope* or *expectation* of ever fulfilling their needs and desires. They will have done this by the simple and easy process of making everybody uniformly and permanently poor.

As for freedom from fear—well, that's simply the promise of a welfare state where the citizens become mere wards of a government that runs everything and dispenses all of the little produced under its iron-clad direction. Moreover, a promise from fear is a denial of man's right to dare, to venture, to win or lose. For how can one dare and venture, to win or lose, without hope of gain or fear of loss? The freedom to risk would necessarily be taken away—and they planned it that way! Freedom from want and fear are easy to find—in a jail. You are housed, clothed and fed. You are protected from your enemies and even your friends cannot bother you! But you can't *go* anywhere or *get* anywhere. The Welfare State with its planned economy is simply the imprisonment of a whole nation.

Our people will have to be as naive as Little Red Riding Hood if they fall for that sort of freedom as now being peddled by wolfish Leftists. But with this background of understanding about real freedom, let's discuss its application by various groups of our people and see how it enriches their individual lives as well as the nation. We are interested in freedom as the substance that catalyzes America—that permeates the fabric of its life and energizes its people. We not only believe in the theory of freedom, we even more believe in its *practice*—in the absolute necessity of its application to *all* phases of American life. American *business* requires freedom—*positive* freedom—freedom *to* rather than freedom *from*. Specifically, freedom—within the limitations imposed upon every citizen in a free society—to manage its own affairs, freedom to earn and retain enough of its profits so that it can freely improve, expand, and experiment and to pioneer new processes and products. It needs freedom to determine its own prices, choose its own markets, plan its own future, and freedom to negotiate with employees without coercion by government.

Those opposed to American business enjoying its traditional freedom often argue that our economy has reached its full growth and therefore all elements in it, *including* business, must *therefore* submit to government planning and control. Some of these economic saboteurs even argue that further growth by industry *specifically*, must be prevented for the good of the nation! The *kindest* thing to be said about these particular characters is that they are not quite bright! They either do not know, or have decided to forget, that the sole reason we have so productive a nation, so prosperous a people, so high a standard of living, is because individual Americans have always had freedom to do and to dare—freedom to work, save, invent, invest, explore, produce, expand—positive, active freedom. In short, freedom to be enterprising Americans.

No government bureau, board or commission fired "the shots heard round the world". Those shots were fired by individual men determined to be *free* men. No corporation, labor union, government, planning board, political party, association of manufacturers or organization of

* Presented before the A.A.T.C.C. Annual Banquet, Atlantic City Convention, October 15, 1949.

chemists and colorists built this nation. America was built by the unregimented brains and brawn of individual Americans, free to choose, free to carve their own careers, and with *incentives* to devote whatever skills, ability and energy they possessed to their separate tasks. Anybody who asserts that American industry has reached its full growth is woefully, willfully and inexcusably ignorant of the nature of our economy.

They do not know what every business man knows: that is, that new and better products, lower prices, higher wages and other features of our ever-rising standard of living come only from a dynamic economy that is free to profit and free to use those profits for the continual improvement and expansion of our industrial plant.

If American businessmen ever sit back and decide they are not going to grow any more, they will no longer be either good Americans or good businessmen. They will be nothing less than liquidators of free enterprise and undertakers for a once dynamic economy and its progressively higher standard of living.

We either grow or we stagnate and rot into ruin, but we can only grow when we have freedom. That's why business has to have freedom! Employees require freedom as much as does business, and for basically the same reason. That is, to grow.

The working man is not a free man unless he is free to take a job and quit a job; free to experiment with jobs until he finds one which suits him.

Every American should have the right to work where he pleases, at wages and under conditions he finds attractive. Every American must be free to bargain with his employer; collectively with other employees, or individually if he prefers. Every American must have freedom to join a union of his own choice, and equal freedom to refrain from joining a union. It is certainly an invasion of his rights as a free man to *compel* him to do *anything*—including joining a union as a condition of employment.

In short, every American should be free to choose his own career, and be free to go as far in that career as his talents and ambitions carry him.

He must be *free*—period! Government economic planning, the "welfare state", government paternalism and union monopolies throttle all of these rights of free men. The fate of working men under Stalin, Hitler and Mussolini has been frightful proof of how easy freedom may be chiseled away until all is lost.

Then there is another application of freedom here in America that is so much a part of our way of life that we seldom think of it. We rarely realize the extent to which its exercise depends upon the existence of the other facets of economic freedom. That freedom is the American *consumer's* freedom of choice—and we are all consumers. In the last analysis the American consumer is the real boss of American industry as long as he has this freedom of choice. Consumers are the great electorate of our economic life!

They decide what shall be produced because they decide what shall be purchased. Consumers fix the prices because they decide what shall be paid for goods and services. Thus, through this free and voluntary system the American consumers are daily voting what shall be produced, in what quantities, and at what cost.

Consumers decree success or failure for styles, brands, designs and models. They decide what industries shall stand or fall —which ones shall be large or small. The company or the industry that ignores the needs and demands of the American consumer writes its own death warrant. But for consumers to have the maximum of freedom of choice, industry must be free to manage its operations to produce the quality and quantity of goods demanded by consumers and at prices they are willing and able to pay. When all business has this freedom there is healthy and constructive competition—competition that benefits consumers and rewards the efficient producer.

Under free, competitive enterprise consumers have the economic power to demand that employers and employees produce better goods at lower prices. They have the power to make some companies big simply by repeatedly voting to use their products. Any company, no matter how big it has grown, if it fails to meet the demands of the buying public, can, under our daily consumer election system, be voted out of existence as quickly or more quickly than it was made. Look at the automobile industry! In its history there have been 1700 companies offering more than 1700 kinds of cars. Now there are 34 and of these 4 are exceptionally large because they offer popular cars. Did you ever hear of them attempting to divide up the market between them, or of putting their heads together and deciding what kind of automobiles they would produce for the public? Not on your life!

Look at the marvelous offerings made to the American public this year. Each company tries to outdo the other in capturing the imagination and loyalty of motorists. Each has experts who study their desires, needs and complaints and each is striving to produce cars that will be better than any other cars produced by their competitors in the various price ranges. That's what keeps them all alive.

The automobile industry peps up the railroads to give us streamliners, and the airlines to furnish better service. American consumers, because of their tremendous economic power, can get results that government can talk about and plan but can never achieve. For under the whiplash of government men will produce only what they have to, and under socialism only what the bureaucrats think we ought to have. But spurred by the competitive struggle for profits—the wine of fair rewards—men will produce as well and as much as they are able. Thus, the American consumer's freedom of choice is a key factor in economic freedom. It generates competition which, in turn, results in more and better goods and services at lower prices. But in order to have competition the competitors themselves must be free to compete.

The extent to which consumers have freedom of choice is determined by the extent to which American business is permitted by government to pioneer, experiment, innovate and expand. It must be obvious then that any curtailment of free competitive enterprise by government or by private monopoly is an attack on every consumer's freedom of choice. There is nothing greater nor more important that we can leave in trust for our children than freedom, without limitation, dilution or adulteration; to pass on to them the individual freedom which this nation has always recognized as the God-given right of every human being. We must admit that we have not always consistently, competently and faithfully discharged our duty and responsibility as free Americans and trustees of this priceless heritage of freedom. Too often we swallowed the pill of expediency and paid the price of a long-term headache. Too often we have reached for a short-term gain at the cost of a greater loss.

In our preoccupation with the immediate problem, we have ignored the future then being plotted by those who would sabotage the craft of democracy. We have failed to keep always in mind that everyone pays the penalty whenever any form of freedom, or anybody's freedom is crippled or throttled by the heavy hand of government. In short, we have not accepted and discharged the responsibilities of the freedom which we inherited—the freedom which we desire and require—the freedom which we want to pass on to our children.

There is not much time left. The foes of freedom are well past the fifty yard line—deep in our territory—and they still have the ball! We have to act and to play as a team of free Americans —a team that will tackle each and every

threat to freedom—a team that will defend America against the triple-threat of Socialism-Communism-Fascism.

We can win! We can do it defending individually the other fellow's freedom as vigorously as we defend our own. We can win when we individually accept the responsibilities of freedom—when we individually put the national interest ahead of our own. We can win when we take an active interest in political affairs. We can win by being good citizens, good business men and good Americans. We *will* win when we realize that defeat means the death of the kind of America that Washington, Franklin, Jefferson, Patrick Henry and the other Founding Fathers fought to establish—the kind of America we inherited—the kind of America we know, love and want to leave for our children.

You men need no battle cry from me. We will *win* because we *must* win!!

Let's go.

—♦ ♦—

Report of Pacific Northwest Section Meeting

THE first meeting of Pacific Northwest Section was held at the Multnomah Hotel, Portland, Oregon, on Tuesday evening, November 1, 1949 with thirty-four members and guests in attendance.

Following a social hour and dinner, the meeting was called to order by R. M. True, Secretary Pro tem. A resolution to institute the Pacific Northwest Section was adopted after which a report of the Nominating Committee was submitted by A. H. McKenzie.

The following officers were elected for the year 1950.

Chairman—Earl B. Brearley
Vice-Chairman—Otto E. Schmidt
Secretary—Robert M. True
Treasurer—William C. Marshall
Councilor—Charles K. Bishop
Section Committee—A. H. McKenzie, Jr.
R. B. Mulcrone
Tom Kay, Jr.
E. B. O. Lindquist, Jr.

Chairman Earl B. Brearley introduced the Section officers and a guest, Dr. Charles Weidmann, Ciba, Inc., Basle, Switzerland.

The speaker of the evening was J. Raymond Nehmens, of E. I. du Pont de Nemours & Co., who presented a paper on "The Processing of Nylon." This was illustrated by slides and dyed fabrics.

Plans for the future activities of the Pacific Northwest Section will be announced by the Section Committee at a latter date.

Respectfully submitted;
R. M. TRUE
Secretary

October Meeting, Rhode Island Section

Photos by Kenneth C. Everett

F. L. Dennet, Fiber Treatment Section, Dow-Corning Corporation, who spoke at the October 28th meeting of the Rhode Island Section on the subject: "Silicones in the Textile Industry."

J. K. Park, Manager, Research Department, Owens-Corning Fiberglas Corp., who discussed "Fiberglas: Its Properties and Applications" at the October meeting of the Rhode Island Section. The meeting was held at the Providence Engineering Society Hall.

Report of Hudson-Mohawk Section

A MEETING of the Hudson-Mohawk Section was held on September 23, 1949 at Jack's Restaurant, Albany, New York.

Bertram J. Garceau, Research Group Leader of Arnold Hoffman & Co., Inc., presented a paper entitled "Surface-Active Agents." An interesting discussion period followed the paper.

Sixty-nine persons were present for the dinner with 72 in attendance for the meeting.

Respectfully submitted;
WILLIAM A. NELSON
Secretary

—♦ ♦—

Correction, Philadelphia Section Report

IN the report of the September 16th meeting of the Philadelphia Section published in the issue of October 31st, the name of the technical speaker was inadvertently omitted. He was Robert D. Robinson, Bachmann Uxbridge Worsted Corp., and his subject was "High Temperature Dyeing."

—♦ ♦—

WNE Section to Meet December 9th

THE next meeting of the Western New England Section will be held at the Hotel Green, Main Street, Danbury, Connecticut, on Friday evening, December 9th. A dinner will precede the meeting and reservations may be made with Robert N. Brownlee, U. S. Rubber Company, Naugatuck, Connecticut.

During the social hour a movie on hat styling will be shown.

The speaker will be Ivor Griffith, who has a reputation as an accomplished orator and is sure to provide an entertaining and authoritative address. Mr. Griffith was Director of Research for the John B. Stetson Company from 1924 to 1941 and since 1941 he has been President of the College of Pharmacy in Philadelphia. During 1943 he was Research Director for the Frank H. Lee Company.

ONE HUNDRED AND SIXTY-NINTH COUNCIL MEETING

THE Council held its 169th meeting in the Hotel Haddon Hall, Atlantic City, N. J., on Thursday morning, October 13, 1949. Present were: President Henry F. Herrmann, presiding; John N. Dalton and C. Norris Rabold, vice-presidents; William R. Moorhouse, treasurer; William D. Appel, William H. Cady, Carl Z. Draves and P. J. Wood, past presidents; J. Robert Bonnar, Chairman of the Research Committee; Ralph E. Hale, C. Wendall Lever and George O. Linberg representing Northern New England; Raymond W. Jacoby, Robert W. Joerger and George H. Wood representing Rhode Island; Harold H. Taylor representing Western New England; Winn W. Chase, Herman E. Hager and William A. Holst representing New York; Albert E. Herrmann, Jr. representing Hudson-Mohawk; Arthur W. Etchells, Walter F. Fancourt 3rd, Richard L. Jones, Morris H. Klein, William O. Neeb and Frederick V. Traut representing Philadelphia; Wyss L. Barker and John B. Neely representing Piedmont; Jack Anderson representing South Central; A. Kempton Haynes and Walter M. Scott representing Southeast; David O. Hamer of the Hudson-Mohawk Section; J. Edward Lynn of Western New England; Paul J. Luck of the Publicity Committee; and Harold C. Chapin, secretary.

The Secretary's report of the 168th Council meeting, the financial report of October 3, and the audited Treasurer's report for the year ending July 31 were accepted.

For the Research Committee, Mr. Bonnar reported that rules for conduct of research sub-committees were being printed. In the activities of these various committees, 328 people were currently engaged. Fastness tests of the Society of Dyers and Colorists were under examination with view to collaboration. Progress was being made in agreement on tests for the International Standards Organization. A further contribution, from the National Retail Dry Goods Association, added to contributions from the Rayon Yarn Producers and Cotton Textile Institute, had brought the special fund for research on fabric flammability to a total of $5,000. For the Corporate Membership Committee, Mr. Little reported plans for seeking new members.

For the Colour Index Committee, Mr. Holst reported progress toward a contract, and the mailing of the first set of questionnaires on acid colors to manufacturers. Mr. Luck reported on publicity, Mr. Jacoby on the Vat Color monograph, Mr. Etchells on the convention technical program, Mr. Kennedy on the Intersectional Contest, and the Secretary on manufacture and sale of apparatus and standards sponsored by the Association.

The date of the next Council meeting, in the Hotel New Yorker, was changed to January 13, 1950.

Mr. Dalton presented membership applications from the following, who were elected to the classes of membership specified, as of thirty days from publication of applications, provided no objections be received meanwhile by the Secretary:

Senior

C. F. Belcher	G. E. Montgomery
W. H. Bertolet, 3rd	G. E. Motz
F. W. Binns	G. M. Neville
E. O. Bryant	J. M. Newton
N. Cavinato	R. E. O'Neil
R. G. Cooper	F. Perutz
J. S. Crist	H. N. Piligian
E. M. Dodson	E. J. Rath
A. Fleischman	J. Reese
M. J. Gardner	J. M. Roddy
B. R. Gorini	D. Rottcher
R. N. Grauch	C. H. Schuettler
M. Grossman	C. C. Smith
E. H. Johnson	D. V. Speese
M. A. Kise	O. W. Stake
I. J. LaBossier	H. C. Thompson
W. R. LaChapelle	J. G. Todd, Jr.
F. E. Lademan	S. L. Vinci
A. F. Linden	F. W. Ward, Jr.
J. L. McConnell	C. P. Weber
R. T. McNamara	H. W. Wolf
E. C. Merkle	

Junior

A. C. Anderson	M. E. Kaiser
J. J. Benischeck	J. M. McChesney, Jr.
G. A. Caron	L. K. McChesney
J. F. Cobianchi	R. A. McGurren
M. L. Fillippeli, Jr.	D. A. E. Newman
H. Habig	J. J. Rourke
D. I. Hall	L. Russo

Associate

S. Brooks	C. D. Laubach
H. R. Chandler	A. Linn
A. M. Foster	F. A. Stallings
N. C. Foster	F. A. Taberski
H. H. Gilmann	R. Woods
R. A. Jaegers	

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS
SECRETARY'S FINANCIAL REPORT—OCTOBER 3, 1949

Received and transmitted to Treasurer,	*Applications*	*Dues, regular & Reinstate*	*Dues, Corporate & Sustaining*	*Miscellaneous*	*Totals*
August 1 to September 2, 1949	$281.00	44.00	0.00	$ 736.40	$1,061.40
September 2 to October 3, 1949	375.00	74.00	0.00	1,729.76*	2,178.76
Totals in fiscal year to October 3	656.00	118.00	0.00	2,466.16	3,240.16
Leaving deposited by Treasurer with Secretary					5,437.20
Miscellaneous items				*	
Dividends				$ 70.00	
N.R.D.G.A., expense reimbursement				141.51	
Reporters and reprints				1.95	
Year Books				493.65	
Crockmeters				154.00	
Crock cloth				80.40	
Moth cloth				92.25	
Water test apparatus				1.00	
Dyed standards				7.00	
Knitted tubing				35.00	
Buttons				12.00	
Color transfer charts				10.00	
Analytical Methods				631.00	
				$1,729.76	

Student

W. E. Aldrich	J. J. Harand
R. C. Andrews, Jr.	P. G. Harris, Jr.
C. O. Asbell	C. L. Henry, Jr.
S. E. Berenberg	H. C. Herndon
W. C. Blackstone, Jr.	S. L. Ho
G. R. Boleman, Jr.	C. C. Hulsey
I. L. Brand	J. E. Johnston
L. F. Catania	V. H. Koltun
J. W. Casteen, Jr.	W. J. Kosowicz
A. J. Chaiken	J. L. Lacerte
J. L. Clarke	R. Lapointe
J. E. Collins	T. A. Mays
T. M. Cook	J. E. Miller
J. E. Copeland	J. D. Noonan
H. E. Corley	Z. S. Norville
F. A. Covington	G. S. Y. Poon
J. R. Davis, Jr.	F. P. Powell, Jr.
R. E. Denio	A. J. Richard
T. Dostanko	X. A. Rivera
H. B. Dowell	I. G. Ross
M. I. Finkelstein	H. A. Summers
B. O. Fleming	H. J. Swiatek
I. Franco	J. W. Taylor
G. M. Greenberg	C. H. Thompson
T. F. Griffin	Z. S. Touloukian
W. L. Hammond	M. J. Yates

Transferred from other classifications to Senior membership were:

P. J. Fynn	J. B. Patti
D. F. Lowry	M. J. Williams
O. A. Ofjord	

Respectfully submitted,
H. C. CHAPIN,
Secretary.

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

49-26

Education: Textile institute graduate, chemistry, dyeing and finishing.

Experience: Operations, administration and laboratory, quality control and product development.

Age 32; married; references; New England preferred.

10-17, 10-31, 11-14, 11-28

49-27

Education: B. S. in Chemical Engineering.

Experience: Research Chemist and Bleachery Foreman.

Age 35; married; references.

10-17, 10-31, 11-14, 11-28

49-28

Education: Textile School graduate.

Experience: Laboratory technician and color chemist.

Age 32; married; references; position as asst. dyer desired.

11-28, 12-12, 12-26, 1-9

49-29

Education: Graduate, tech. inst., chem. engr.; with graduate courses.

Experience: textile research chemist, technical sales.

Age 35; single; position as salesman of dyestuffs and textile chemicals in vicinity of New York preferred, but will go elsewhere.

11-28, 12-12, 12-26, 1-9

49-30

Education: High school with college extension courses in chemistry.

Experience: dyeing and finishing of synthetic fiber fabrics, including testing and development.

Age 28; married; references; eastern U. S. preferred.

11-28, 12-12, 12-26, 1-9

49-31

Education: graduate, technical institute.

Experience: laboratory technician to head dyer, cotton and synthetics.

Age 44; married; references; vicinity of New York, or eastern states preferred.

11-28, 12-12, 12-26, 1-9

49-32

Education: textile institute graduate.

Experience: chemist and dyer, including supervision.

Age 31; married; references; will go anywhere.

11-28, 12-12, 12-26, 1-9

LAPEL BUTTONS FOR A.A.T.C.C. MEMBERS

•

These buttons bear the seal of the Association and may be purchased by members in good standing from the National Secretary at $2.00 each.

•

DR. H. C. CHAPIN
Lowell Textile Institute
Lowell, Mass.

COLOUR INDEX

SECOND EDITION

The A.A.T.C.C. *Colour Index* Committee now working on the second production of the *Colour Index* would welcome information on errors which readers have noticed in the first edition.

Please address all communications to:

WILLIAM H. CADY
127 POWER STREET, PROVIDENCE 6, R. I.

"Analytical Methods for a Textile Laboratory"

(A.A.T.C.C. Monograph No. 1)

CONTENTS:

General Instructions
Standard Solutions
Reagents
Methods of Sampling
Methods of Analysis of Chemicals
Determination of Finishing Materials
and
Determination of Resins and Resin Finishes
Identification of Dyestuffs on the Fiber
Determination of Textile Fibers
Useful Tables and Calculations

Dr. H. C. Chapin, Secretary, A.A.T.C.C.,
Lowell Textile Institute,
Lowell, Massachusetts

Dear Sir:

Enclosed is my check for $.....covering payment of.....copies of "Analytical Methods for a Textile Laboratory."

Name .....

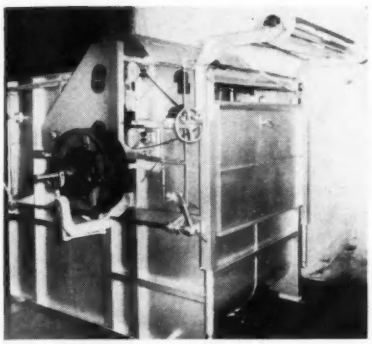
Street Address.....

City..... **Zone No.**..... **State**.....

This book of 287 pages, attractively bound, and well indexed, may be obtained from the Secretary, A.A.T.C.C., Lowell Textile Institute, Lowell, Mass., postpaid, for six dollars. To A.A.T.C.C. members, for one copy only, the price is five dollars.

For convenience in ordering, use coupon at left.

TRADE NOTES • NEW PRODUCTS



Riggs and Lombard Fulling Mill

• Fulling Mill

Riggs & Lombard of Lowell, Mass., Manufacturers of The Fleet Line of Wet Finishing Equipment, have added an all stainless steel fulling mill to their line. All parts of this machine, except a few outside levers and brackets and the roll coverings, are reported to be of stainless steel. The rolls are of rubber ring construction with stainless steel end plates, while pressure and lift are regulated through Finger Tip Pneumatic Control.

This mill is said to be of great value where white goods are fulled as there is no danger of their being contaminated by foreign matter. This might possibly be the case if the sides were of wood and some inside parts of iron. Due to the smoothness of the all stainless steel parts that contact the fibers, a better handle (or feel) is reportedly imparted to the fabric.

The upper sides are integral with the sides, making the mill extremely stable and free from vibration. The heavy duty guides and packing boxes which are said to have been so successful on the standard fulling mills have been retained.

• Check Testing Service

Merck & Co., Inc., manufacturers of "Amuno" announce that all users of this moth resistant treatment for woolen fabrics will have the check testing services of the Better Fabrics Testing Bureau, Inc., New York, to help assure proper and adequate use of the product.

"Amuno" is supplied by Merck & Co., Inc., manufacturing chemists, Rahway, New Jersey, under license, and has reportedly been used successfully for 12 years as a moth resistant for woolen fabrics, blankets, yarn and feathers.

The Better Fabrics Testing Bureau, Inc., will make chemical and biological tests on samples of each lot supplied by the manufacturer, using "Amuno," and will grant the privilege of using the Better Fabrics Testing Bureau seal of approval on the finished products approved, the company states.

• New Hercules Assignments

Expansion in the sales and development activities of CMC, Hercules Powder Company's cellulose gum, has brought about two new assignments in personnel.

Effective December 1, Leland H. Burt will be supervisor of CMC development and Werner C. Brown will be supervisor of CMC sales.

Hercules is reportedly the first company in this country to produce this chemical on a large scale basis, beginning commercial production in November, 1946.

Hercules CMC, also known as sodium carboxymethylcellulose, is reported to readily dissolve in either cold or hot water to form colloidal and highly viscous solutions possessing marked suspending, thickening, stabilizing, and film-forming properties.

• Special Grade Mercuric Iodide

More accurate visual comparisons with standard Nessler solutions are said to be effected by the use of a special grade of Mercuric Iodide now being prepared by Eimer and Amend, 635 Greenwich St. New York 14, New York.

The Iodide, which reportedly meets American Chemical Society specifications, is said to form a clear solution with the possibility of very slight precipitation, readily filterable. The solution is said to remain stable without formation of a precipitate.

A strong emulsifying agent, detergent and dispersant in the U. S. P. grade of Sodium Lauryl Sulfate is also available from Eimer and Amend. It is an anionic surface-active agent claimed of particular usefulness in clinics, hospitals and pharmacies.

Charles A. Seibert

• Seibert Retires

Charles A. Seibert, division head of textile research in Du Pont's Technical Laboratory at Deepwater Point, N. J., has retired after serving the company for 23 of his 50 years in the dyestuffs industry. His home is in Salem, N. J.

Only last month, Mr. Seibert received the American Association of Textile Chemists and Colorists' Olney Medal for outstanding achievement in textile chemistry.

Born October 18, 1884, in New York City, Mr. Seibert started in the dyestuffs industry on completion of grammar school, in 1899, when he went to work in the laboratory of Oakes Manufacturing Company in Long Island City, N. Y. He worked there for eight years, studying scientific methods of preparing and using natural dyes.

Within a few years he changed to synthetic dyes. Between 1910 and 1914, he collaborated in the first use of cold dyeing Algol colors to dye uniforms in khaki and olive drab shades. He also applied vat dyes for the first time on a practical scale to both raw and "boiled off" silk, and collaborated in developing the "one bath" method for resisting woolen thread with tannic acid.

After operating his own dye house in Conshohocken, Pa., for a short time, he joined Du Pont in May, 1926. For many years he has headed a group at the technical laboratory responsible for numerous technical sales assignments, evaluation of new products, and research on dyestuffs applications.

Mr. Seibert has held various offices in the Philadelphia Section of the A.A.T.C.C. and has been chairman of five different

research subcommittees on test methods for color fastness. He takes an active interest in the civic affairs of Salem, and has worked with the Boy Scouts, Red Cross and Civilian Defense.

He has a son, Charles Albert, Jr., a student at the University of Notre Dame, and a daughter, Mrs. G. McCausland, the former Margaret Catherine Seibert. Mr. and Mrs. Seibert live at 41 Chestnut Street in Salem.

• New Booklet on Catechol

The Chemical Division of Koppers Company, Inc., Pittsburgh 19, Pa., has issued a new technical bulletin describing the uses, chemistry, and properties of catechol.

The 28-page bulletin covers both technical and commercial information, the pharmacology and toxicology of the compound, and available information on its uses and its chemical reactions. Important uses for catechol reportedly have been found in photography, dyes and fur dyeing, as antioxidants for rubber and plastics, in pharmaceutical products and in perfumery.

Copies of the bulletin may be had by writing the Chemical Division, Koppers Company, Inc., Pittsburgh 19, Pa., and asking for Bulletin C-9-127.

• Bulletin on Corrosion-Resistant Materials

U. S. Stoneware has released a bulletin (Bull. M) describing their corrosion-resistant materials and equipment. This 8-page booklet as well as their 16-page bulletin (51-C), which gives facts and tables about tower packing and construction, are available on request without cost by writing to Process Equipment Division, U. S. Stoneware Co., Akron 9, Ohio.

Bulletin M contains information and illustrations on the following items: tygon tubing, gasketing, protective coatings, lining materials, grinding and mixing equipment, chemical stoneware, white chemical porcelain, masonry, ceramics, and tower packing.

• Furniture Show Features

Brilliant, new color lines and patterns in weather-resistant upholstery for outdoor furniture were style news features of the recent summer furniture show in Chicago.

In selecting patterns and colors for the Chicago showing, members of the National Association of Summer Furniture Manufacturers capitalized on two outstanding developments. They are a vinyl Ultrosol coating produced by Monsanto Chemical Company, St. Louis 4, Missouri, and a multicolor printing process developed by Permatex Fabric.

Coated with Ulutrosol, a vinyl resin, the fabrics are said to acquire a hardihood that withstands abrasion and moisture and is highly resistant to alcohol, acids, alkalies, vegetable and body oils. In addition, the coating remains flexible even at sub-zero temperature and is washed easily with soap and water, the company states.

The Ultrosol-coated fabrics are reported available in three different color combinations and in any one of the following Ficks Reed 1950 summer colors: cinnamon brown, mango, mint, green, peacock blue, saffron yellow, romaine, and papaya.

Simmons Company exhibited its new Simfast finish for chrome frames, a green metallic coating that blends with green tones, ranging from leaf to lime, used on the Permatex fabrics.

• Rutter Retires

The retirement of J. B. Rutter, vice president of Monsanto Chemical Company and general manager of its Merrimac Division, has been announced by William M. Rand, Monsanto president.

Mr. Rand disclosed that Mr. Rutter, who is retiring early in order to devote full time to service as an industrial consultant, has been retained by the company in the latter capacity. The retirement was effective November 1. Mr. Rutter plans to open offices in Boston after January 1.

As director of engineering for Monsanto prior to his appointment as general manager of the Merrimac Division, Mr. Rutter played a prominent part in developing Monsanto's position in the synthetic rubber program.

Mr. Rutter's first association with the Merrimac plant came little more than 30 years ago after graduation from Tufts College in 1914. He served as a vice-president in the company since 1947.

• Edwal Transfers Offices

The Edwal Laboratories, Incorporated, announce the transfer of the sales and administrative offices and research laboratories to their plant at Ringwood, Illinois.

This move will enable Edwal to make fuller use of expanded facilities at Ringwood where the plant has been located since 1941.

Personnel involved in this move include Walter S. Guthmann, president; Seth L. Szold, vice president and treasurer; J. F. Kaplan, technical director in charge of contract manufacturing; Morton Schwarcz, chief chemist; and Lester J. Perlman of the sales division.

F. M. Sell

• Sell Joins Dan Fiver

F. M. Sell is now with the Research Division of Dan River Mills, Danville, Va. Mr. Sell has been Chief Chemist at the National Marking Machine Company, Cincinnati, Ohio, for the past fifteen years, and is holder of numerous patents on laundry and dry cleaning identification systems and inks.

• Calco Chemical Training Program

As part of a training program started in 1932, American Cyanamid Company, Calco Chemical Division, Bound Brook, N. J. announces the membership of the current group selected for its technical training program: William R. Biles, B.S. Ch.E., University of Cincinnati; Mitchell S. Dimitri, M.S. Ch.E., Georgia Tech.; Robert B. Fortenbaugh, Ph.D. Chem., Johns-Hopkins; Hermes O. Grant, B.S. Ch.E., University of Virginia; Robert A. Hardy, Ph.D. Chem., Yale University; Harold Marsh, Ph.D. Ch.E., Purdue University; Thomas Rees, Ph.D. Chem., Yale University; Gerard N. Vriens, Ph.D. Ch.E., Purdue University; Clyde N. Whitesides, B.S. Tex. Chem. & Dye., North Carolina State; Robert E. Whitfield, Ph.D. Chem., Harvard University; and Philip A. Woerner, B.S. Tex. Chem. & Dye., North Carolina State.

Recent additions to its technical staff include: Stephen E. Ulrich, Ph.D. Chem., Rutgers University; Arder W. Bush, B.S. Chem., University of Virginia; John J. Campbell, Jr., B.S. Ch.E., Rensselaer Polytechnic Institute; Ernest A. Hewett, B.S. Chem., New York University; Marsden C. Hutchins, M.S. Ch.E., University of Maine; and Robert R. Kaedle, B.S. Chem., Marietta College; Miss Nancy B. Drier, B.A. Chemistry, Gettysburg College; Mrs. Janice D. Miner, A.B. Chem., Connecticut College.

• General Aniline Executive Appointments

A series of executive appointments at the General Aniline Works Division plant, of General Aniline & Film Corporation at Grasselli, N. J., has been announced by Plant Manager Russell T. Baker. The appointments are effective November 1st.

Dr. Edwin A. Meier, of Cranford, N. J., manager of the Sulfur Colors and Textile Auxiliaries Department has been named technical assistant to the plant manager.

Dr. Hans Beller, also of Cranford, N. J., will head Dr. Meier's former production area and will continue as manager of the Carbonyl Iron Powder Plant and the New Fields Department.

Dr. Melvin R. Stevinson, of Union, N. J., production manager, has been appointed manager of the Process Development Department and Russell L. McKnight, of Roselle Park, N. J., manager of the Industrial Engineering Department has been named to the post of production manager.

Dr. Fred Ebersole, of Short Hills, N. J., assistant manager, Process Development, is appointed production control manager succeeding Graham N. Gleysteen, of Plainfield, N. J., who has been named senior chemist in the division's Triphenylmethane Department at the Rensselaer, N. Y., plant.

• Dye Runs of Acetate Fabrics in Vat Colors

John M. Gessler, President of Vat-Craft Corp., New York, N. Y., has announced that the first successful commercial run of acetate fabrics in vat colors had taken place at the Shamrock Textile Processing Company in Paterson, N. J., a subsidiary of which holds the first license granted by Vat-Craft for commercial use of its process. He stated that the Vat-Craft process was developed by Dr. Leonard E. Ravich, the firm's Vice-President in charge of Research.

The method employed for the handling of these fabrics was the new Vat-Craft process for which patents have been applied by that firm. This process reportedly involves the application of vat colors in specially prepared form to the fabric, after which sensitisors and catalysts are added before the colors are developed photochemically.

The machinery on which the fabrics are run is said to be capable of handling many types of natural and synthetic fabrics under controlled tension. Successful commercial runs of viscose fabrics have also been completed by Shamrock, and it is stated that attention is now being paid to fabrics which have traditionally been more difficult to dye.

It is stated that, in the early stages of this development, American Viscose Corporation technicians saw in it an opportunity to make important improvements in the dyeing and finishing of rayon fabrics. With this objective, American Viscose devoted to the project the facilities of its textile research department at Marcus Hook, Pa. for engineering, testing and evaluation work extending over a period of two years.

The equipment was developed by Vat-Craft's technical staff in collaboration with Proctor and Schwartz, Philadelphia, manufacturer of the first production machine, the General Electric Company, manufacturers of the special lamps required for developing the colors, the Corning Glass Works, manufacturers of the 96 per cent silica glass required for the development chamber, and the Van Vlaanderen Machine Company, designers of the special dye padders used in the process.

Uniformly level dyeing of viscose is claimed for the process; acetates can be dyed without saponification, and both fabrics receive superior fiber penetration, it is reported. It is expected that a high degree of production efficiency will be demonstrated, the company states.

Vat-Craft officials stated that additional information regarding the new process, including actual performance data, would be made known at a later date.

• New Anti-Foam Agents

Dearborn Chemical Company, 310 South Michigan Avenue, Chicago 4, has announced the development of new organic anti-foam agents especially applicable to the textile field. The new anti-foams reportedly possess properties which would make them applicable as a textile lubricant, besides being a specific defoamer.

The compounds are acylation products of polyethylene polyamines condensed with naphthenic acids. These naphthenyl amides are highly viscous oils, dark in color, and readily dispersible in water on moderate agitation, it is stated.

Samples of the products are available as water dispersible basic materials and acetate salts.

• Wool Research Aid

Announcement of the formation of a distinguished group of wool scientists and mill technologists from government and industry who will pool their knowledge and experience to advise on the internationally sponsored wool research project at Princeton was made by The Wool Bureau.

The group was organized at a meeting of the sponsors of the project at the Textile Research Institute, Princeton, where its American phase is based.

Functions of the Working Committee reportedly will be to evaluate and apply all phases of scientific development in practical mill operation. Members of the Committee are: Bert L. Bertelson, Botany Mills, Incorporated; Walter Hamburger, Fabric Research Laboratories; Milton Harris, Milton Harris Associates; R. M. Ingham, Jr., Deering-Milliken Research Trust; H. P. Lundgren, Western Regional Research Laboratories, U. S. Department of Agriculture; L. W. Rainard, Alexander Smith and Sons Carpet Company; Evan Urquhart, Bachmann-Uxbridge Worsted Corporation; W. von Bergen, Forstmann Woolen Company; J. H. Wakelin, Textile Research Institute; and G. E. Hopkins, Wool Bureau, Incorporated, representing the American Wool Council and the International Wool Secretariat.

Supported by wool growers of the United States, Australia, South Africa and New Zealand, manufacturers of wool textiles and carpets, and the U. S. Department of Agriculture, the project is aimed to find ways for improvement of products made from all grades of wool. Studies under way involve the factors of wear, protection, quality and appearance which are important to producers of wool and wool products as well as the consuming public. A collateral project concerned with chemical modifications of the wool fiber and improved methods for wool scouring is being carried on simultaneously by the Regional Research Laboratories of the U S. Department of Agriculture at Albany, California.

• Meta-Benzenedisulfonic Acid Bulletin

The Chemical Division of Koppers Company, Inc., Pittsburgh, Pa., has announced publication of a technical bulletin describing the physical and chemical properties meta-Benzenedisulfonic acid (MBDSA), an intermediate compound now is being produced in pilot plant quantities by Koppers. The bulletin also contains recommended uses for the product.

A dibasic sulfonic acid produced in grey to white crystals, MBDSA reportedly undergoes reactions typical of benzene sulfonic acid and can be nitrated, sulfonated, or converted to acid chlorides, it is stated. The ordorless acid is extremely hygroscopic and is soluble in water, ethanol, and acetone, the company claims.

MBDSA has been suggested for use as an additive in the electroplating of certain metals, as an intermediate for dyestuffs, pharmaceuticals, and photographic chemicals, and as a catalyst for esterifications for curing of condensation type resins.

The seven-page technical bulletin, which also describes proper methods of storage and handling and contains a list of technical references, may be obtained by requesting Bulletin C-9-53 from Koppers.

• Avisco Shifts Managers

Managers of the Marcus Hook and Lewistown plants of the American Viscose Corporation will exchange places tomorrow (Nov. 15). F. Farwell Long, manager of the Marcus Hook plant for the last ten years, will become manager of the Lewistown plant. He will be succeeded at Marcus Hook by Harold J. Michel.

Both men have been actively associated with the rayon industry for many years. Mr. Long was employed by E. I. DuPont de Nemours & Co. in chemical engineering work before joining American Viscose Corporation on Sept. 22, 1922. In 1939 he was named manager of the Marcus Hook plant to succeed Arthur Hayes.

Mr. Michel, who is a native of Utica and a graduate of Hamilton College, joined the Skenandoa Rayon Corporation when it was organized and served in several executive posts before becoming manager. He joined American Viscose Corporation in 1946 as manufacturing superintendent at Lewistown and was named manager in 1947.

• 31st Annual ASA Meeting

The Waldorf-Astoria in New York was the site of the thirty-first annual meeting of the American Standards Association, held October 11 through 14.

The following were among the speakers: Dr. Wilson Martindale Compton, president of Washington State College and Alternate Delegate of the United States to the United Nations; Joseph P. Greenwald, economist with the International Resources Division of the U. S. Department of State; George S. Case, Sr., chairman of the Board of the Lamson and Sessions Company; Dr. H. S. Osborne, chief engineer of the American Telephone and Telegraph Company; Vincent deP. Goubeau, director of materials for RCA Victor Division of the Radio Corporaiton of America; William H. Kiler, head of the engineering standards section of E. I. du Pont de Nemours & Company's Engineering Department; I. V. Williams, materials engineer of the Bell Telephone Laboratories; T. J. Finan, manager of the Training Section, Camden Plant, RCA Victor Division, Radio Corporation of America; and Thomas D. Jolly, vice president of the Aluminum Company of America.

Officers of the Association, re-elected for the coming year, are: Mr. Jolly, president; Harold S. Osborne, chief engineer of the American Telephone and Telegraph Company, vice-president; W. C. Wagner, Executive Department, Philadelphia Electric Company, Chairman of Standards Council; and J. R. Townsend, Materials Engineer, Bell Telephone Laboratories, Inc., Vice-Chairman of Standards Council.

• A.S.T.M. Awards for Wool Science

For the first time in its history, the American Society of Testing Materials presented awards for outstanding scientific contributions to the wool industry. At a luncheon in the Benjamin Franklin Hotel, the recipients of the awards were Werner von Bergen, Director of Research for the Forstmann Woolen Company of Passaic, New Jersey, and A. Griffiim Ashcroft, Director of Research for the Alexander Smith & Sons Carpet Company of Yonkers, New York.

Mr. von Bergen received his scroll from Dr. S. J. Kennedy, Research Director in the Office of the Quartermaster General in Washington. Dr. Kennedy praised Mr. von Bergen's work as chairman of the wool fiber section of the wool subcommittee for the past fifteen years, during which time "his scientific contributions have aided tremendously in the development of wool standards and test methods."

In presenting the scroll to Mr. Ashcroft, Dr. J. H. Dillon, Director of the Textile Research Institute at Princeton, said it was given as "a mark of deep appreciation for his tireless efforts as chairman of the wool subcommittee (of the Society) for the past ten years," during which time "he recognized the need for standardization and test methods, and pioneered the development of statistical techniques and quality control."

Among the guests who witnessed the presentation were Maitland L. Griggs, Vice President and Treasurer of the Alexander Smith & Sons Carpet Company; Kenneth Wilson, Vice President of the Forstmann Woolen Company; Werner A. Mueller, of the Wool Division of the United States Department of Agriculture; F. Eugene Ackerman, Chairman of the Executive Committee of the Wool Bureau, and Giles E. Hopkins, its Technical Director. Oliver P. Beckwith of the Research and Development Control Division of the Alexander Smith & Sons Carpet Company, acted as master of ceremonies.

• Physical Science Internships

Excellent opportunities now exist for outstanding students in science and engineering to broaden their undergraduate or graduate training through vacation-time employment and graduate fellowships offered by the National Bureau of Standards. The Bureau has established an integrated work-study program, beginning at the college-sophomore level, for the selection and training of its research scientists and engineers. This program permits the student to alternate periods of full-time study with actual work experience in his chosen field, supplemented by on-the-job training and orientation courses at the Bureau. At the same time it enables the Bureau to select promising students, upon graduation, for permanent appointment to its staff and to provide them with opportunities for professional growth and advancement through further in-service training.

Work at the Bureau includes basic and applied research, development, testing, calibration, and scientific advisory services. This diversity of activity reportedly permits the student to choose work in his particular field of interest and to broaden his experience through contact with other related lines of work at the Bureau.

There are essentially three programs of interest college and university students: the internship program for undergraduates, the regular training program for college graduates on the staff, and the fellowship program for graduates engaged in working for advanced degrees.

Information regarding qualifications for appointment may be obtained from the Personnel Division, National Bureau of Standards, Washington 25, D. C.

• U. S. Testing Expands Detergent Lab

The United States Testing Company, Inc. of Hoboken, New Jersey, has added equipment and expanded the staff of its detergent laboratory for the testing of soaps, synthetic detergents and other surface active agents.

In this laboratory it will reportedly be possible for an industrial user to have new products compared, in small-scale operations which simulate his own full-scale operations, with those he is now using.

The use of this service, it is said will save the prospective buyer much time, and eliminate the possibility of expensive reprocessing if the material under test does not perform as expected.

• Rodney Hunt Brochure

Rodney Hunt Machine Co., Orange, Mass., has published a new brochure devoted entirely to their "Tensitrol" washers. By means of working drawings, photographs, comparative cost tables, and on-the-job-test results, this publication reportedly presents for the first time a complete picture of the invention.

The "Tensitrol" principle is described as a "variable traction of all the drive rolls on the fabric, the amount being determined automatically by the behavior of the cloth itself as it travels through the machine."

A free copy may be obtained by qualified persons by writing on their stationery.

• New Staple Fiber by Carbide

Dynel, the new generic name chosen for its staple fiber, has been announced by Carbide and Carbon Chemicals Corporation. This new name specifically denotes acrylonitrile-vinyl chloride staple to distinguish it from the older "Vinyon" yarns developed by Carbide.

Among Dynel's reported advantages are high resilience, "loft," warmth, strength, fire resistance, moth-proofness, and fungus inertness. In addition, the fiber is said to possess dimensional stability and rapid drying. It reportedly can be dyed readily on conventional machinery and is expected to sell at a moderate price. Dynel can be handled easily on the cotton, wool, worsted, and spun silk systems, it is stated.

C. and C. reports, "Fabrics made of dynel will not support combustion. They will char, but when the source of ignition is removed, there is no further burning. Clothes moths and carpet beetles starve to death rather than attack dynel fibers. The complete mothproofness of the fiber is of special interest for apparel, blankets, and floor coverings."

The report continues, "The high resilience of dynel fibers contributes unusual and permanent 'loft' of fabrics. The fibers are non-felting and this characteristic makes possible materials that will stand vigorous launderings without loss of fabric resilience. The product is light in weight, launders and dry-cleans well without shrinkage. Dynel fibers do not absorb water; only the surface is wet. This means that dynel fabrics will dry rapidly. Dynel fabrics can be laundered in high concentration of detergents and soaps without deterioration, though fabrics made from this material can be steam-pressed without losing any of their good qualities; however, they should not be hot ironed. Experience with stabilized knit and woven fabrics made from dynel indicates that pressing is often not necessary."

Fabrics made of the fiber reportedly will not support fungus, mildew, or bacterial growth. Tests under adverse conditions are said to have shown that the dynel fabrics were not affected even after being buried six months in moist soil. This quality is expected to be especially useful for many applications in warm, moist climates. A characteristic of importance to industrial users is that of dynel's resistance to chemical attack.

Bright colors with good fastness to light, washing, and crocking are said to have been attained with a large number of acid-type dyestuffs. Acetate colors, although inferior to the acid dyestuffs in light fastness, can reportedly be employed to give good wash and crock fastness.

At present, dynel is available in development quantities. However, Carbide is said to have started to provide for a substantial increase in production capacity at its present South Charleston, West Virginia, plant. These commercial facilities are expected to be in operation sometime in the second quarter of 1950.

• DCAT Announces Meeting Dates

Harold C. Green (L. Sonneborn Sons, Inc.), Chairman of the Drug, Chemical & Allied Trades Section of the New York Board of Trade (DCAT), announced following an Executive Committee meeting that the 24th Annual Dinner of the DCAT would be held on Thursday evening, March 9, 1950, at The Waldorf-Astoria, New York. He also announced that the Section's 60th Annual Meeting and Election would take place September 21-23, 1950 at Shawnee Inn, Shawnee-on-Delaware, Pa. Mr. Green stated that special committees would be appointed for each of these events to take charge of the program and other details.

The DCAT is also planning a Mid-Winter Luncheon Meeting about the third week in January. Charles P. Walker, Jr., (Citro Chemical Co.), Chairman of the Section Activities Committee, is in charge of this luncheon. Speaker, time and place will be announced at a later date.

• Hydrogen Chloride Production Equipment

A booklet describing and illustrating equipment for the production of hydrogen chloride gas by burning hydrogen and chlorine has been issued by National Carbon Co., Inc., 30 East 42nd St., New York 17, N. Y.

The booklet describes the graphite combustion chamber and the impervious graphite burner nozzle, outlines the operation of the complete system, and points out the principal features of reported superiority (e. g., long life, absence of corrosion, minimum maintenance, the ability to withstand thermal shock, the simplicity of the system and the moderate installation cost). Capacities of the combustion chambers and sizes of the burner nozzles are listed in a table, followed by assembly drawings of the equipment.

A copy of Catalog Section M-9602, *"National" Graphite Combustion Chambers and "Karbate" Burner Nozzles,* may be obtained by writing to National Carbon Co., Inc.

• Speaks to Rotary Club Members

Hillary Robinette, Jr., Research Director of Amalgamated Chemical Corp., Rorer and Ontario Streets, Philadelphia 34, Pa. was a recent speaker before a meeting of the Sea Isle City (N. J.) Rotary Club. His subject was "Recent Developments in Textile Chemicals" and included the use of high polymers in producing textile fibers. Among the fibers he discussed were: nylon, Vinyon, Velon and Saran. Mr. Robinette also pointed out the uses of high polymers in producing textile finishes. He stated that, in addition to using high polymers to modify the "Hand", they are also used for functional finishes to prevent shrinkage, to prevent slippage, to bond pigments and dyestuffs to fabrics and yarns, to size yarns, to impart water repellency, and to impart flame resistance. A third large use of high polymers in connection with textiles is in the coated fabric business.

Mr. Robinette is a graduate of Temple University and served as a Captain with the Textile Section of the Research and Development Branch, Military Planning Division, Office of the Quartermaster General, during World War II. He was awarded the Army Commendation Ribbon for his work on protective clothing.

Before the war he was with Rohm and Haas Company, W. H. and F. Jordan Mfg. Co., and Commercial Solvents Corporation. Following his release from service in December, 1945, he became associated with Publicker Industries, Inc., and later joined Amalgamated.

Mr. Robinette is a member of the A.A. T.C.C. and also the American Chemical Society, American Association for the Advancement of Science, Academy of Sciences, Chemists' Club of New York, Organic Chemists' Club of Philadelphia, and the Quartermaster Association.

• Textile Scholarships Examination

The New England Textile Foundation, 68 South Main Street, Providence, R. I. announces its annual examination for textile scholarships at four textile colleges in New England will be given in May (20th) next year. Up to 25 freshman scholarships will be awarded to students with the highest marks and other qualifications. Any high school or preparatory school senior or graduate not over 21 years of age on July 1, 1950, will be eligible to compete. A scholarship has a value of $500.00 per year and is subject to renewal each year until completion of a four year course, provided the student has a satisfactory standing. Thus,

each scholarship is in effect a $2,000 four year scholarship.

The examination will be given by the College Entrance Examination Boards at various centers throughout the United States but students wishing to take it should write direct to the Foundation for instructions. Applications must be filed with the Foundation by February 15, 1950 at the latest.

• Commonwealth Elects New VP

The Commonwealth Color & Chemical Co. announces the election of O. B. Bertram, a 30 year veteran with the firm, to the office of vice-president.

The appointment is in line with Commonwealth's recently inaugurated expansion program highlighted by the company's removal of its headquarters and plant to a new modern plant at 3240 Grace Avenue, New York 67, N. Y.

• Liquid Detergent Development

The Atlantic Refining Company, 260 S. Broad St., Philadelphia, Pa., has announced the development of Ultrawet 60L, a new liquid detergent.

This new amber-colored liquid is an organic alkyl aryl sulfonate which is 60% active and 40% water. Ultrawet 60L reportedly remains crystal clear at temperatures below 20°F. The company states that this feature, coupled with high foaming characteristics, excellent detergency and strong wetting properties, is expected to result in substantial demand for Ultrawet 60L as a diswashing detergent both in the household and in restaurants, hotels, taverns, etc.

It is further stated that other possible applications where low temperature solubility characteristics may be of value include cosmetic formulations such as shampoos, various textile processes, emulsion polymerizations and insecticidal formulations.

Ultrawet 60L is reported available in tank cars, tank trucks, and specially lined 55-gallon drums.

• Beta Naphthol Plant at Full Capacity

The Hilton-Davis Chemical Company Division's beta naphthol plant (Cincinnati, Ohio) is now running at full capacity, according to James F. Thompson, vice-president of Sterling Drug Inc., who is in charge. The division is using this basic raw material in its own production of red pigments and azo dyes for the printing ink, varnish, and textile industries. A "ready market" exists for all surplus, Mr. Thompson said.

The plant was completed last February and test runs were started at that time. Mechanical difficulties requiring modification of equipment developed. Although the plant was operated on a limited basis during recent months, full capacity, which will amount to a reported 5,000,000 pounds a year, was reached the last week of October, it is stated.

Hilton-Davis is reportedly using the beta naphthol in the production of about 60 organic pigments, including Lithol reds, Red Lake C, Fire Toner, and Toluidine. Hidacid Orange II, an azo dye, is also being made from the same raw material, as is the intermediate tobias acid.

Shipments of surplus are said to be going out in 65-pound bags, packed dry, to other dyestuff and pigment manufacturers.

More than 100 different, custom-manufactured pieces of equipment are involved in the manufacturing process, the company states. Through this equipment the basic raw materials of naphthalene, sulfuric acid and caustic soda are reacted into the finished beta naphthol. The company claims its finished product to be of "highest purity, containing extremely small quantities of alpha naphthol."

• Hercules Personnel Moves

Hercules Powder Company has created two new top posts at its Experiment Station in Wilmington, Delaware.

Dr. Peter VanWyck, formerly technical assistant in the Research Department, becomes assistant director of the Experiment Station responsible for the work done by the Cellulose Products, Explosives, and Virginia Cellulose research divisions.

Dr. Richard S. George, formerly manager of the Naval Stores Research Division, will be assistant director of the Experiment Station responsible for the work done by the Naval Stores, Paper Makers Chemical, and Synthetics research divisions. Dr. Reginald W. Ivett succeeds Dr. George as manager of the Naval Stores Research Division.

The appointments were announced by Dr. Emil Ott, Hercules director of research, and Dr. Raymond F. Schultz, director of the Experiment Station.

The company also announces the transfer of two men from the home office to the Experiment Station research staff. They are: Edmund Winterbottom, who is appointed administrative assistant to Dr. Schultz; and Dr. John T. Hays, appointed special assistant in the Scouting Research Division. Dr. Hays also will continue his university contacts with prospective technical employees.

• Vol. V, "Organic Reactions" Published

Volume V of "Organic Reactions" was published in September by John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. Edited by Roger Adams, this latest volume in Wiley's series contains a discussion of ten important synthetic reactions.

Reportedly written by men who have had special experience with a particular reaction, each chapter is said to provide a general discussion of method, a detailed description of procedure, special precautions, expected yields and other data. Professor Adams, the editor-in-chief, is head of the department of chemistry at the University of Illinois.

• OTS Testing Manual

The testing of materials with the electron microscope is the subject of a manual now available from the Office of Technical Services of the U. S. Department of Commerce.

The manual, prepared to assist in the training of Air Force technicians, is a basic introduction to the nature of the electron microscope, and its contribution to various types of materials problems.

According to the manual, the ability of the electron microscope to reveal visually the size, distribution and shape of particles in the submicroscopic region (less than 1/100,000th of an inch) is of particular importance in accounting for many of the physical and chemical properties of materials. An explanation is provided of the limitations of light microscopes in this realm.

In addition to a theoretical discussion of the problem of image resolution, the manual provides practical information of the construction and operation of the electron microscope, and the preparation of replicas and specimens.

Typical applications of the electron microscope to the examination of finely divided matters and aggregates and to the inspection of surface details of metals, ceramics, and finishes are discussed. Possible future prospects for such fields as lubrication studies are mentioned.

The report contains a number of photomicrographs as well as graphs and illustrations.

PB 97957, *The Electron Microscope and Its Application to Materials Problems*, 48 pages, sells for $1.25 per copy. Orders should be addressed to the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., accompanied by check or money order payable to the Treasurer of the United States.

• 20th Annual T.R.I. Meeting

Andrew E. Buchanan, Jr., Assistant General Manager of Du Pont Company's Rayon Department, will speak on "Textile Progress from Fundamental Research" at the Textile Research Institute's 20th Annual Meeting, December 2nd, according to A. G. Ashcroft, President of the Institute.

Two days of the Textile Research Institute's 20th Annual Meeting will be held at the Waldorf-Astoria Hotel on December 1st and 2nd. Thursday, December 1st, is to be Scientific Research Day with a program consisting of papers by textile scientists. These reports will cover "Some Recent Studies on Wool" by James H. Wakelin, Associate Director of Research, Textile Research Institute and the Textile Foundation; "Biochemical Mechanism of Cellulose Breakdown by Microorganisms" by Ralph G. H. Siu, Research Director, General Laboratories, Philadelphia Quartermaster Depot Research and Development Laboratories; "Recent Researches on Silk Fibroin" by Hugh S. Taylor, Dean of the Graduate School and Chairman of the Department of Chemistry, Princeton University; "Some Aspects of Fabric Hand" by R. M. Hoffman and L. F. Beste, Technical Division, Rayon Department, E. I. du Pont de Nemours and Company (to be presented by L. F. Beste).

The program planned for Friday, December 2nd, will trace the part research plays in the textile industry toward meeting consumers' demand for improved textiles.

The speakers will be W. E. Coughlin, Director, Textile Laboratory, Good Housekeeping Institute, on meeting consumers' needs in textiles; Rene Bouvet, Textile Research Department, American Viscose Corporation, on mill trouble shooting and its future; Walter Hamburger, Director, Fabric Research Laboratories, Inc., on practical applications of fundamental research, and John H. Dillon, Director of Research, Textile Research Institute and the Textile Foundation, on fundamental research progress.

Mr. Ashcroft will present his annual report to the Research Progress luncheon which is to be held in the Grand Ball Room of the Waldorf Hotel. Following this report Mr. Buchanan will address the audience.

Scientific instruments will be featured by leading manufacturers in exhibit booths arranged in the Astor Gallery. These will be open to the public from 9 a. m. to 6 p. m. December 1st and 2nd.

Laboratory open house will be held at the Institute's research laboratories in Princeton, New Jersey, December 3rd, which will conclude the 20th Annual Meeting.

• "History of Cotton Textiles" Available

"The History of Cotton Textiles," a series of 23 educational sketches on the industry which were prepared by the Textile Information Service, 551 Fifth Avenue, New York 17, N. Y., has been compiled in booklet form.

The series was designed originally for publication in newspapers in cartoon strip panel format.

The Textile Information Service and the National Cotton Council of America collaborated in preparing the booklet and will make joint distribution to schools, libraries, etc., and to members of the cotton and cotton textile industries.

Quantity requests will be filled without cost by Textile Information Service.

• Elected Fellows of British Textile Institute

Two American textile experts have recently been elected Fellows of the Textile Institute. They are J. H. Dillon, Ph.D., 126 Jefferson Road, Princeton, New Jersey, and Ernest R. Kaswell, M.Sc.Tech., 58 Larchmont Avenue, Waban 68, Massachusetts.

Elected to Associateship of the Institute is Stanley Backer, B.Sc., 101 Providence Road, Primos, Pennsylvania.

Dr. Dillon, Director of Research at the Textile Foundation and the Textile Research Institute, Princeton, New Jersey, has carried out considerable applied research on tire cord and tire cord fibers. A Fellow of the American Physical Society, and a member of various other American societies, including the A. A. T. C. C., Dr. Dillon has taken out several patents, some of which protect processes concerned with radioactivity. He is a visiting lecturer in Chemistry at Princeton University.

Mr. Kaswell, President and Associate Research Director at the Fabric Research Laboratories, Inc., Boston, Mass., has been responsible for investigation of energy absorption properties of parachute suspension lines; sub-zero properties of textile materials, particularly parachutes used for high altitude, Arctic and Antarctic flying, and the development of nylon hosiery yarn finishes and sizes. He is also credited with a number of publications concerned with the wear-resistance of textiles, electrolytic method for stripping colors from dyed wool, and low temperature properties of textile materials.

Mr. Backer is head of the Textile Materials Engineering Laboratory of the Philadelphia Quartermaster Depot of the U. S. Army and holds the degree of Master of Textile Technology from the Massachusetts Institute of Technology.

• General Dyestuff Releases

General Dyestuff Corporation, 435 Hudson St., New York 14, N. Y. announces release of circulars describing the following products:

Sulpho Rhodamine B Extra—a nondusting acid dyestuff reportedly giving a brilliant, fluorescent, bluish-pink shade quite similar to that of its basic-dye counterpart, Rhodamine B Extra S. As a consequence of being a level-dyeing acid dyestuff, the Sulpho Rhodamine is said to give much better rubbing fastness and penetration than the basic dye, besides being considerably more easy to apply. The product is used for printing and dyeing wool and silk where either exceptional brilliance of tone or fluorescence is more important than good light fastness. It also is said to find considerable use in dyeing as a shading color for lifting the brightness of fast-to-light fuchsia tones, being convenient in that it can be added directly to a boiling dyebath due to its level dyeing.—*Circular G-629.*

Celliton Fast Rubine 3BA for Printing*—a dispersed acetate dyestuff standardized in its physical properties for printing acetate. This product reportedly produces bright shades of bordeaux. It is said to fix easily under most steaming conditions and its fastness to light is claimed very good. Sublimation is also reported good, and like other acetate dyes, its wet-fastness is moderate.—*Circular G-615.*

Celliton Fast Yellow 7GA Conc.*—a homogeneous dispersed dyestuff for the direct dyeing of acetate rayon (estron) and nylon. This is reportedly the greenest and brightest of the company's Celliton yellows and at the same time is said to possess very good fastness to light. Its other fastness propertie are generally reported satisfactory, especially its resistance to atmospheric gas fading since the product is not subject to this type deterioration. The dyeing properties are said to be very good throughout a wide range of temperatures for both acetate rayon and nylon. The product's usefulness for production of a wide range of colors in either delicate tints or deep shades from greenish yellow through green to greenish blue is reported outstanding. Alone, it is said to yield delicate chartreuse or lime tints that are suitable for summer suitings, blouse and evening dress materials, while in combination (especially with Celliton Fast Blue Green BA), it reportedly produces Irish and primitive greens of exceptional brightness. All are light-resistant to a degree where they can be used for upholstery and drapery materials, it is stated. It is further stated that the penetrative power of this yellow and of the green combinations with Celliton Fast Blue Green BA make it suitable

for closely woven materials containing yarns of high twist, such as are encountered in various crepe constructions. Since the product leaves vegetable fibers virtually clear, it yields sharp, contrasting, irridescent effects in a one-bath process on piece goods containing effect threads or fibers (such as those in bengalines, alpacas, romains and shantungs), the company states. The dyestuff is not recommended for printing because of excessive sublimation.—*Circular G622.*

Celliton Orange 3R*—a homogeneous dispersed dyestuff for the direct dyeing and the printing of estron and nylon, said to produce a fairly bright reddish orange shade on acetate of good tinctorial value which makes it useful not only for bright oranges but also as an economical base for browns and tans and as a dulling component of olives. The hue on nylon is appreciably redder than on acetate, and yet it is not so red as that of Celliton Scarlet BA Extra. Since Celliton Orange 3R is reportedly well suited for printing and easily dischargeable, it fills a particularly broad field. When used in combination with Celliton Fast Yellow GA f. Ptg. it is said to make available a wide range of bright golden to reddish orange shades. The product reportedly draws well onto the fiber at all temperatures in dyeing, making it well adapted for use in jigs when flat goods such as satins, bengalines and taffetas are to be dyed evenly from selvedge to selvedge and end to end. In reel dyeing, the level-dyeing and penetrative powers are claimed advantageous, the latter being of particular interest in the dyeing of crepes. White effect threads and fibers of viscose rayon and cotton, such as in some bengalines, are reportedly left satisfactorily clean without special aftertreatment though they can be cleared completely by aftertreatment with permanganate and bisulphite, it is stated. The company reports good to very good fastness to light for the dyestuff. This, taken in conjunction with adequate wet fastness and fairly good fastness to atmospheric fading without aftertreatment, makes it suitable for use wherever acetate fabrics are generally employed, including particularly all dress materials and bathing suits.—*Circular GDC-306.*

Rapidogen Golden Yellow IFG*†—a stabilized azoic composition in powder form, employed for printing bright, golden-yellow shades on cotton, linen and rayon fabrics. Full shades reportedly exhibit very good to excellent (6-7) fastness to light, good to very good (4-5) fastness to washing and good (4) fastness to chlorine. This dyestuff is thus comparable with vat dyestuffs with respect to fastness and is reported generally superior to all other rapidogen yellows except the very greenish-yellow 14GA brand. It is said that by blending these two yellows together in varying proportions, a broad range of yellow shades can be produced without impairment of the fastness to light. The rich golden yellow colors obtained with the product as a self shade are said to fill the need for bright yellows in most printed patterns. It is also said that its fastness to light and washing permits its use wherever the properties are important, such as for draperies, handkerchiefs, slip covers, dress goods, bathing suits and table cloths. Another use for the product is in the printing of cotton fabrics that are to be given a plisse effect by overprinting with caustic soda. Solubility is reported good and adequately stable in print pastes. It is claimed that it fixes completely in 3-5 minutes when given a normal acid aging. Rapidogen Golden Yellow IFG cannot be applied by the developer RNA method for development in a neutral ager and, thus, cannot be printed alongside vat colors. However, it can be shaded with properly selected Algosols without loss of light or wash fastness, the company states. —*Circular G-628.*

† U. S. Pat. No. 1,923,202.
* Reg. U. S. Pat. Off.

Book Review

Dyeing with Fast—AVIK—Dyes

By D. G. Kale, B. Sc. Published by M. D. Kale, 11/248 Souterganj, Kanpur, U. P., India, 1949.

The author of this interesting little book, who is a native of India, explains its somewhat cryptic title in the preface as follows: "The word "AVIK" has been coined as a short and sweet term by selecting the first letter of each of the four classes of dyes viz:—Azoic, Vat, Indigosol, Khaki—discussed in this book."

Althuogh he evidently had India particularly in mind in writing "a standard practical book for the benefit of the teachers, the taught, and those engaged in the dyeing trade", the book should have an appeal in any English-speaking country, not only for students but for practical mill men as well. It is written in a simple, lucid style, in remarkably good English, with a great deal of detail and many practical suggestions, some of which it would be difficult to find in any other similar work. The chapter on Khaki, for example, from both a historical and a practical standpoint is quite unique. The chapter on the fermentation vat for Indigo is also good reading.

References to such modern developments as the "Pad-steam", "Abbot-Cox", "Multi-lap", and "Kupensaure" processes and the "Williams Unit" indicate that the author is strictly up-to-date in his reading of the technical literature. If some sections appear unduly emphasized (e.g., the dyeing of Para Red, now obsolete in this country), we must realize that conditions in India are probably different.

As is inevitable, a few inaccuracies have crept into the text, e.g., a soap bath at 120°C. (p. 41); "anthraquinone (vat) dyes are not easily applicable to piece goods" (p. 83); "Copper and brass are to be strictly avoided in vat dyeing)" (p. 92). The statement "It has been recently discovered that the introduction of nitrogen into the composition of an active vat dye converts it into a safe dye" will be news to some of us.

The book is well printed, though the binding is not too rugged, and has a competent index.—W. H. C.

BECCO HYDROGEN PEROXIDE

Make full use of

BECCO TECHNICAL CONSULTATION

Becco technical engineers have a wealth of knowledge and practical experience to bring to your bleaching requirements. Becco laboratories have accumulated a large amount of valuable data applicable to your problems.

Let this Becco service assist you in producing higher quality, lower cost, uniform bleaching of all fibres by all methods — including continuous bleaching. Write or call—at no obligation.

BECCO SALES CORPORATION

AGENTS FOR BUFFALO ELECTRO-CHEMICAL COMPANY, INC.

BUFFALO 7, NEW YORK

New York Boston Philadelphia Chicago Charlotte

QUALITY L R PERFORMANCE

We EXPORT . . .

DYESTUFFS

of desirable

- shades
- properties
- concentration

L. L. RONA & CO., INC.

Established 1929

40 Exchange Place
New York 5, N. Y.

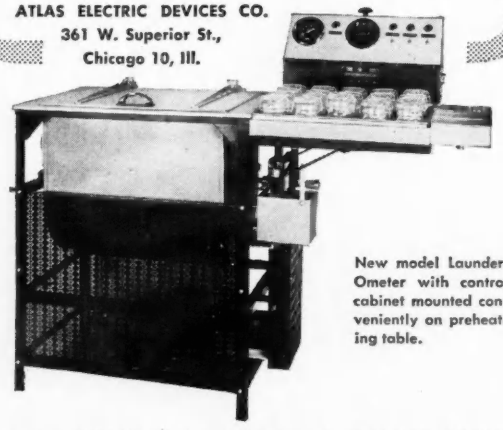
Cable Address
"ELRONA"

ATLAS Launder·Ometers

Accurate data concerning color fastness, shrinkage, detergency, and resistance to washing and mechanical action is quickly provided by accelerated washing tests in Atlas Launder-Ometers — standard laboratory washing machines of the A.A.T.C.C.

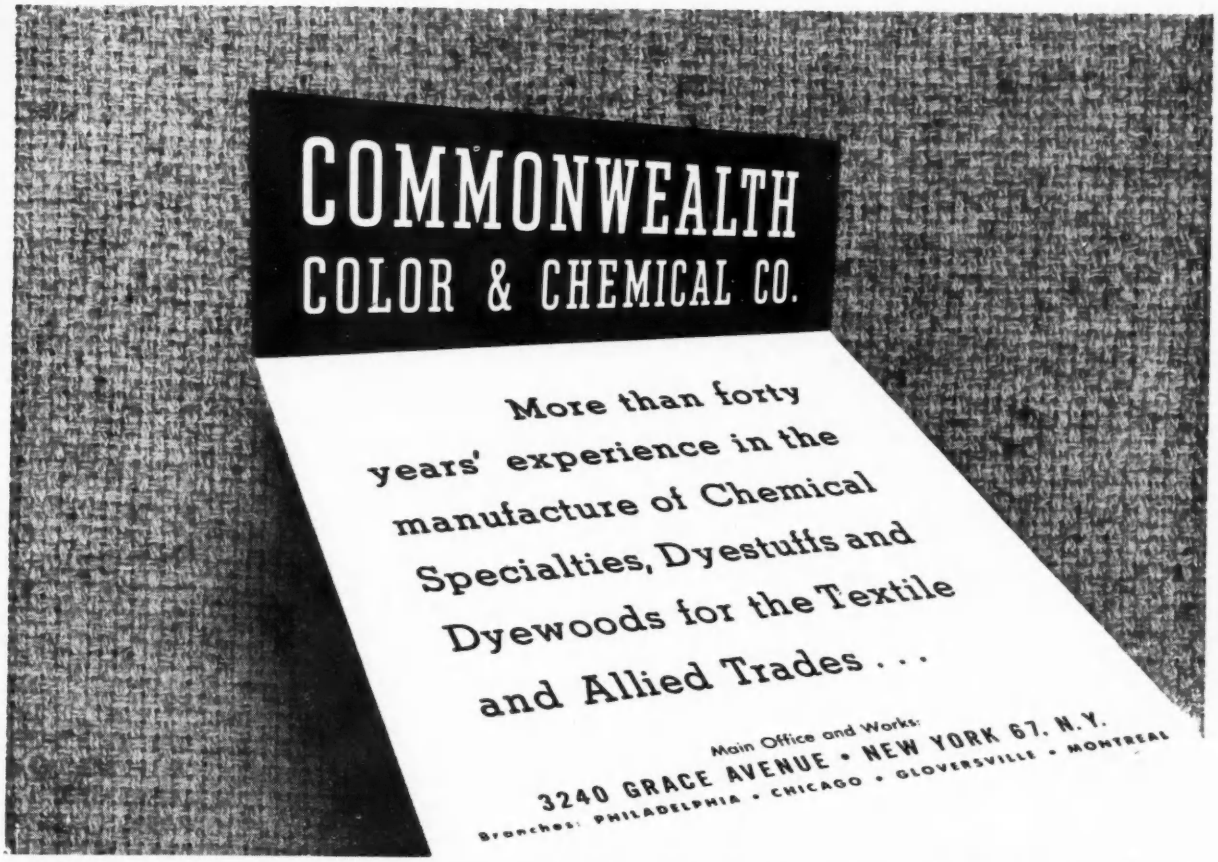
Equipped with a new cabinet containing all switches, pilot lights, indicating and control instruments located directly behind the Preheating Loading Table, Launder-Ometers now offer easier and more precise control of tests.

ATLAS ELECTRIC DEVICES CO.
361 W. Superior St.,
Chicago 10, Ill.



New model Launder-Ometer with control cabinet mounted conveniently on preheating table.

LAUNDER-OMETERS • FADE-OMETERS • WEATHER-OMETERS


COMMONWEALTH
COLOR & CHEMICAL CO.
More than forty years' experience in the manufacture of Chemical Specialties, Dyestuffs and Dyewoods for the Textile and Allied Trades . . .
Main Office and Works:
3240 GRACE AVENUE • NEW YORK 67, N.Y.
Branches: PHILADELPHIA • CHICAGO • GLOVERSVILLE • MONTREAL

HASTINGS LIGHT FAST VIOLET IRS—(C. I. 1073)
and
HASTINGS LIGHT FAST VIOLET 3RL

Excellent Level Dyeing Properties
Very Good Fastness to Light

Recommended for producing fast shades on
Ladies' Dress Goods, Carpet Yarn and Upholstery Materials.

ZINSSER & COMPANY, Inc.
ESTABLISHED 1897
Manufacturing Chemists
HASTINGS-ON-HUDSON NEW YORK

PENETRANTS • DETERGENTS • SOFTENERS • REPELLENTS • FINISHES

BURK-SCHIER

BURKART-SCHIER CHEMICAL CO., CHATTANOOGA, TENN.

• CLASSIFIED ADVERTISEMENTS •

DYER WANTED—Completely new modern plant in Virginia has opening for a Dyer experienced on Viscose and Acetate Piece Goods. State age, qualifications and salary expected. Write Box No. 693.

WANTED—QUALITY DYEHOUSE DESIRES EXPERIENCED JIG DYER TO OPERATE THIRD SHIFT. Write Box No. 721.

WANTED — Salesman with practical knowledge of dyeing and finishing to sell textile specialties in Middle West for old established manufacturer. Prefer one with following. State age, experience, and compensation expected. Writ Box No. 733.

SALES REPRESENTATIVE AVAILABLE: Formerly with leading European Dyestuff manufacturer over 20 years experience, seeks position with progressive concern N. Y. area or Partnership in established business. Write Box No. 732.

POSITION WANTED — Chemist Executive, Ph.D. Expert in dyestuff intermediates, vat and related dyes, and general synthetic organic chemistry. Over twelve years' experience in research, development, and production of dyes, intermediates, textile auxiliaries, surface-actives, specialties, photographic chemicals, terpenes, etc. Publications, patents, university teaching. Presently division head. Desires supervisory or advisory position with considerable responsibility. Write Box No. 734.

POSITION WANTED: Dyestuff laboratory technician and color matcher. Thoroughly experienced testing and demonstrating dyestuffs on all fibers. Print shop and laboratory background. Top references. Write Box No. 735.

POSITION WANTED — Colorist, textile printing. Thoroughly experienced roller and screen printing on all fabrics. Supervise production. Complete technical knowledge. Highest references. Write Box No. 736.

POSITION WANTED—Laboratory and Plant trained chemist. 12 years as overseer of Bleaching and Dyeing all types of rayon and cotton. Familiar with all print works operation. Age 39. Superintendent material. Write Box No. 727.

WANTED: EXPERIENCED FOREMAN DYER, with laboratory background. Write complete qualifications. Replies strictly confidential. Write Box No. 720.

FINISHER WANTED: Experienced on Filament Viscose Acetate and Nylon mixtures. Technical training desirable but not essential. Excellent opportunity. Metropolitan area. Write complete qualifications. Replies strictly confidential. Write Box No. 725.

POSITION WANTED: Chemical Engineer, Chemist. Wide and diversified experience in textile field, manufacturing processes, fiber technology, both here and abroad. Scientifically qualified with Masters degree. Research and technical writing experience. Write Box No. 737.

DYESTUFF CHEMIST with experience in research and development of dyes, particularly acetate. Location near New York. Salary according to experience. Ample opportunity for advancement. Our employees know of this ad. Write Box No. 738.

WANTED—Assistant Superintendent in a large dye and print plant doing a substantial yardage of plain dye work in silk and synthetics. Metropolitan area. Excellent opportunity. Write Box No. 739.

SALESMAN WANTED—textile chemist with commercial formulations, strong capital backing needs services top-notch salesman with following, for new company. Write Box No. 740.

• CLASSIFIED ADVERTISEMENTS •

PRODUCTS DEVELOPMENT CHEMIST — Must have detailed industrial knowledge to develop, with the aid of our laboratories, new products that will solve definite industrial problems. Must have contacts and experience in specific industries so that such products can be field-tested. This offer is made by a well-established Eastern organic chemical manufacturer with excess plant capacity. Salary and liberal bonus commensurate with ability. Write Box No. 742.

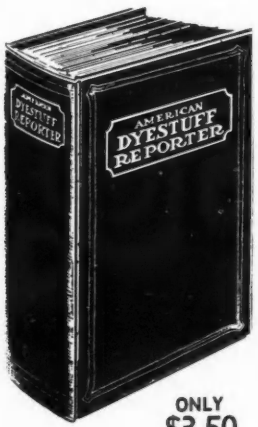
WANTED—Experienced Dyestuff Chemist for laboratory of progressive diversified mill handling all fibers. Must be graduate of textile school or college. Write Box No. 741.

TRY

A

CLASSIFIED!

Have you ordered this handsome Binder



ONLY
$3.50
POSTPAID

for your American
DYESTUFF REPORTER

Every issue snapped into place in this beautiful maroon leatherette binder with the title AMERICAN DYESTUFF REPORTER in genuine gold leaf as shown. It is large enough to hold 26 issues. It looks and handles like the finest book in your library. The best we could find for the permanent preservation of your copies of the AMERICAN DYESTUFF REPORTER.

It opens flat for easy reference.

Please send check with order to:

AMERICAN DYESTUFF REPORTER
ONE MADISON AVENUE
NEW YORK 10, N. Y.

Here's Your Headquarters for

ACETATE DYES INTERMEDIATES

Let Turner—a name whose products you *know*—be your headquarters for this complete quality line of acetate dyes and intermediates. The Para Amino Acetanilide, Quinizarine and PNOT are excellent intermediates for many dyestuff processes.

Investigate these Quality Products

ACETATE DYES • QUINIZARINE
PARA AMINO ACETANILIDE
PARA NITRO ORTHO TOLUIDINE
(Fast Scarlet G Base)

SELLING AGENTS FOR
CROWN CHEMICAL COMPANY

JOSEPH TURNER & CO.
RIDGEFIELD, NEW JERSEY
PROVIDENCE • CHICAGO
Direct New York Telephone: CHickering 4-7531

IT'S WHAT IS IN THE DRUM THAT MAKES THE DIFFERENCE

SEMICAT-C

A NEW CATIONIC SOFTENER
Particularly Good
for SPUN NYLON
GIVES IT THAT WORSTED FEEL

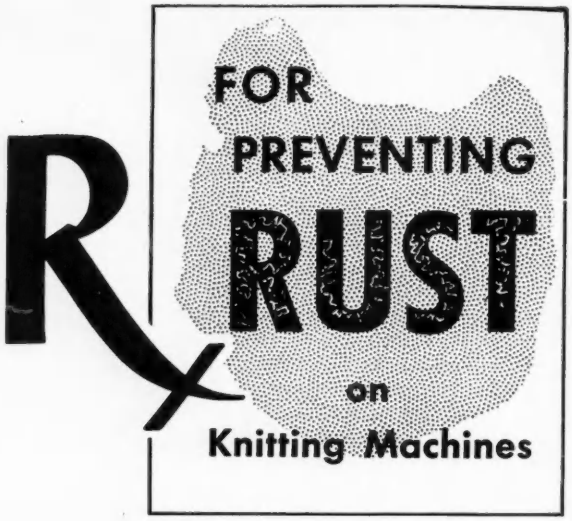
So. Office - 617 Johnston Bldg., Charlotte, N. C.

SEND US SAMPLES AND FURTHER INFORMATION

FIRM .....
ADDRESS .....
CITY ..... STATE .....
NAME .....

1041-43 Frankford Ave. Phila. 25

RICHMOND OIL, SOAP AND CHEMICAL COMPANY INC.



Zurn Heavy Metakote

Metakote is an exceptionally effective rust preventative—stainless, transparent and easy to apply. You simply brush Metakote on the metal parts of your full-fashioned machines, leaving a thick or thin coating as desired. Metakote has a neutral reaction —will not cause oxidation or discoloration, and is easily removed. Give your machines the protection they deserve with Zurn Heavy Metakote. Write.

Specialties for
SCOURING
STRIPPING
PENETRATING
FINISHING
LUBRICATION

Oils for all textile conditioning requirements.

O. F. ZURN COMPANY
PHILADELPHIA 32, PA.
Knoxville, Tenn. • Hamilton, Ontario, Canada

● INDEX TO ADVERTISERS ●

Aktivin Div., The (Heyden Chemical Corp.)
Alco Oil & Chemical Corp.
Althouse Chemical Co., Inc. — Second Cover
Amalgamated Chemical Corp.
American Aniline Products, Inc. — VII
American Cyanamid Co. (Ind. Chem. Div.) — Back Cover
American Dyewood Company
Arkansas Company, Inc. — VIII
Armour & Co. — XXV
Arnold, Hoffman & Co., Inc.
Atlantic Chemical Co., Inc. — IV
Atlantic Refining Company, The
Atlas Electric Devices Co. — XVIII

Barry Chemical Co.
Becco Sales Corp. — XVIII
Bick & Co., Inc.
Blickman, Inc., S.
Burkart-Schier Chemical Co. — XX
Butterworth Sons Co., H. W.

Calco Chemical Division, American Cyanamid Co.
Calgon, Inc.
Campbell & Co., Inc., John
Carbic Color & Chemical Co., Inc. — XIV
Carbide & Carbon Chemicals Corp.
Chem-Col Co., Inc.
Ciba Company, Inc.
Colgate-Palmolive-Peet Company
Commonwealth Color & Chemical Co. — XIX
Crucible Steel Company of America

Dow Corning Corp.
Drew & Co., Inc., E. F. — Third Cover
Du Pont de Nemours & Co., E. I.
Ammonia Dept.
Dyestuffs Division — Front Cover
Electrochemicals Dept.
Fine Chemicals Division

Emery Industries

Fancourt & Co., W. F.

Geigy Company, Inc.
General Chemical Division, Allied Chemical & Dye Corp.
General Dyestuff Corp. — IX
Girdler Corp., The
Glycerine Producers' Association
Grinnell Co., Inc. — XXIII
Gross & Co., A.
Gurley, W. & L. E.

Hardesty Co., W. C.
Hart Products Corp.
Hercules Powder Co.
Heyden Chemical Corp.
Hilton Chemical Corp.
Hilton-Davis Chemical Co., The — XVII
Hinnekens Machine Company
Hooker Electrochemical Co. — X
Houghton & Co., E. F.

Interchemical Corp., Textile Colors Div.
International Nickel Co., Inc.
International Salt Co., Inc.

Kali Mfg. Co.
Kearny Manufacturing Company, Inc.
Kelco Co.
Koppers Co., Inc.

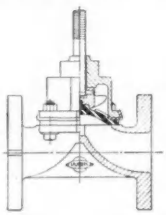
Laurel Soap Mfg. Co., Inc. — XXV
Leatex Chemical Co.
Leeds & Northrup Co.

NEW! Grinnell-Saunders Diaphragm Valves *power operated* by Bendix-Westinghouse Rotochambers

dependable power operation and remote control

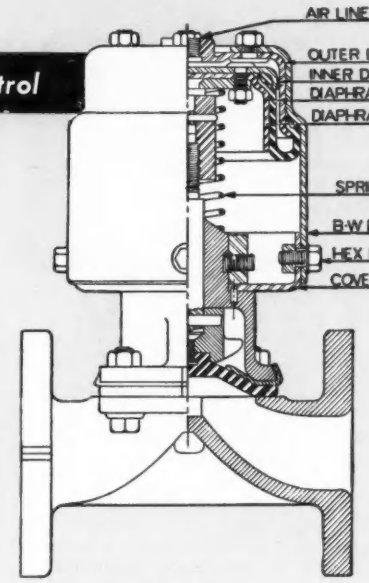
FEATURES:

- Bendix-Westinghouse Rotochamber top-works has rolling sleeve type of seal . . . leakproof and practically frictionless. No packing glands and no lubrication required.
- Pressed steel cylinder is neat looking, light and compact. Height of 2″ flanged air-to-close valve from center line to top is only 9¾″; air-to-open valve (in open position) is 14⅛″.
- Bendix-Westinghouse top-works has been tested up to seven million strokes without any sign of wear or failure.
- Top-works may be operated with air or hydraulic pressures up to 105 pounds. For pressures up to 100 pounds in the line being controlled, an actuating pressure of only 50 pounds is required under average conditions. Pressure reducing valves are not required for pressures up to 105 pounds because of adjustable stem travel stops incorporated in the valve bonnet design.
- Adjustment is easily made without removal of top-works from valve body.

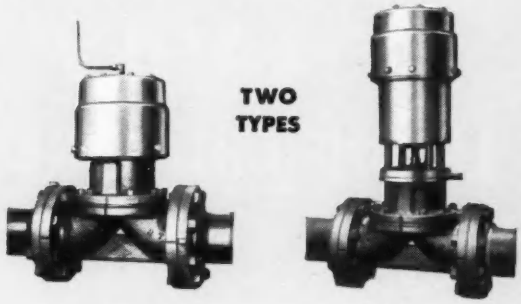


Sliding stem bonnet assembly is suitable for use with other valve motor units. Sliding stem bonnets are interchangeable with other bonnet designs.

YOU GET THESE ADVANTAGES IN ANY GRINNELL-SAUNDERS DIAPHRAGM VALVE: Diaphragm isolates working parts from the fluid, preventing corrosion of these parts and contamination of the fluid; diaphragm opens wide for streamlined flow; diaphragm presses tight for positive closure, even with suspended solids in the line; body, lining and diaphragm materials to meet service conditions; simple maintenance.



air to close, spring to open



4″ air to close, spring to open

4″ air to open, spring to close

GET THE WHOLE STORY on this and other Grinnell-Saunders Diaphragm Valves. Send coupon below for new Catalog 4-S, just out.

Grinnell Company, Inc.
264 West Exchange St.
Providence 1, R. I.

Please send me a copy of your new Catalog 4-S of Grinnell-Saunders Diaphragm Valves.

Name.....

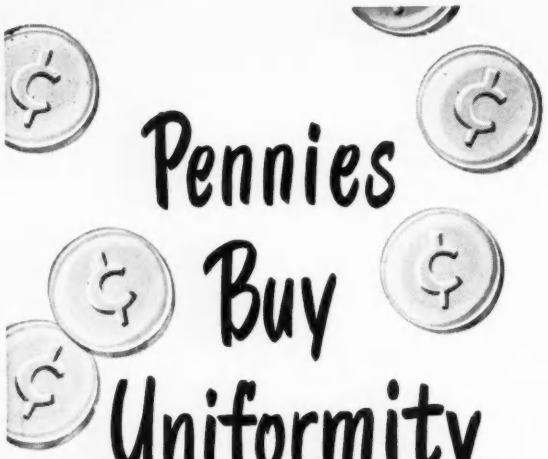
Company.....

Address.....

.....

99 YEARS PIPING

GRINNELL



Pennies Buy Uniformity + Economy

when you bleach with

SOLVAY

TRADE-MARK REG. U. S. PAT. OFF.

LIQUID CHLORINE

You pay far less for your bleaching agent when you specify SOLVAY LIQUID CHLORINE. Yet its efficiency and uniform results have been proved over and over again through long usage.

Outstanding firms agree on this tried-and-true method. Outstanding firms *use* SOLVAY LIQUID CHLORINE—for high performance, low-cost bleaching.

SOLVAY SALES DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

BRANCH SALES OFFICES:

Boston • Charlotte • Chicago • Cincinnati • Cleveland
Detroit • Houston • New Orleans • New York • Philadelphia
Pittsburgh • St. Louis • Syracuse

INDEX TO ADVERTISERS

Manhattan Storage & Warehouse Co.	
Mathieson Chemical Corp.	
May, Inc., Otto B.	
Maywood Chemical Works	
Metalsmiths Div., Orange Roller Bearing Co., Inc.	
Monsanto Chemical Co.	XII, XIII
National Adhesives	
National Aniline Division, Allied Chemical & Dye Corp.	XVI
National Milling & Chemical Co.	XXV
Nopco Chemical Co.	
Nova Chemical Corp.	
Nuodex Products Co., Inc.	
Nyanza Color & Chemical Co., Inc.	
Onyx Oil & Chemical Co.	XI
Pabst Sales Company	
Perkins & Sons, Inc., B. F.	
Pfizer Co., Inc., Chas.	
Philadelphia Quartz Company	
Pittsburgh Plate Glass Co.	
Procter & Gamble	VI
Prufcoat Laboratories, Inc.	
Refined Products Corp.	V
Richmond Oil Soap & Chemical Co., Inc.	XXI
Rodney Hunt Machine Co.	
Rohm & Haas Company	
Rona & Co., Inc., L. L.	XVIII
Royce Chemical Co.	
Rumford Chemical Works	
Sandoz Chemical Works, Inc.	
Scholler Bros., Inc.	
Sharples Chemicals, Inc.	
Sindar Corp.	
Socony-Vacuum Oil Co., Inc.	
Solvay Sales Div., Allied Chemical & Dye Corp.	XXIV
Standard Brands, Inc.	
Standard Chemical Products, Inc.	
Standard Corrugated Case Corp.	
Standard Fabricators, Inc.	
Stein Hall & Co., Inc.	
Stowe-Woodward, Inc.	
Swift & Company	III
Synthron, Inc.	
Tennessee Eastman Corp.	
Turner & Co., Joseph	XXI
Ultra Chemical Works, Inc.	
Union Carbide & Carbon Corp.	
United Chemical Products Corp.	
U. S. Stoneware	
U. S. Vanadium Corp. (Niacet Chemicals Div.)	
Vanderbilt Co., Inc., R. T.	
Van Vlaanderen Machine Co.	XXVI
Verduin Machine Corp., John	
Virginia Smelting Co.	
Wallerstein Co., Inc.	
Watson-Park Company	
Winthrop-Stearns, Inc.	
Wolf & Co., Jacques	
Wyandotte Chemicals Corp.	
Young Co., J. S.	
Young Aniline Works, Inc.	
Zinsser & Co., Inc.	XIX
Zurn Co., O. F.	XXII

LAUREL SYNTHETIC DETERGENTS

speed your textile processing . . . cut costs -superior penetrants, scours, softeners

Laurel Diotrene T – excellent penetrant and softener. Recommended as a wetting agent . . . may be used in finishing bath as softener.

Superterge L – efficient penetrant and dispersant. Stable in lime or acids. Satisfactory in hard water. May be used for scouring cotton goods and as aid in level dyeing all types of colors. Has outstanding absorbent and rewetting qualities.

Supergel RS – good scour used alone or in combination with alkalies. Fine dispersant, fast penetrant as well. Recommended for scouring cotton and synthetic fibers.

The speedy action of Laurel's new synthetic penetrants and detergents has won the approval of leading textile processors... their unusual penetrating and scouring qualities produce efficient results even in hard water.

Textile Soaps, Oils, Finishes

LAUREL SOAP MANUFACTURING CO., Inc.

Wm. H. Bertolet's Sons

ESTABLISHED 1909

Send today for trial order of these versatile Laurel Synthetic Detergents.

Laurel Hydrosol • Laurel Hosiery Finishes *Laurel Textile Oils*

WAREHOUSES: Paterson, N. J., Charlotte, N. C., Chattanooga, Tenn.

2601 E. TIOGA STREET, PHILADELPHIA 34, PA.

NAMICO

NAMICO "C" FLAKES

Quality Plus Versatility

A tried and proven low-titer soap for the rapid processing of all types of fibers, yarns and fabrics—

- **Fulling and scouring of woolens and worsteds from tropicals to heaviest meltons.**
- **Wool raw stock scouring.**
- **Hosiery degumming and scouring—yarn scouring.**
- **Soaping off vats in dyeing and printing.**

Assures low costs, low extractions, and fine finishes that appeal to today's discriminating buyers.

National Milling & Chemical Co.

Industrial Soap Products Since 1896

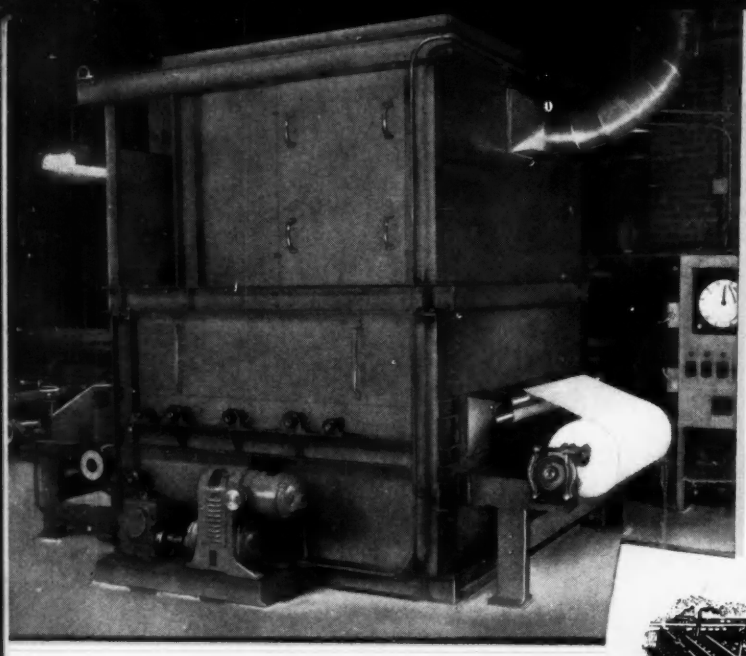
4603 NIXON STREET, PHILADELPHIA 27, PA.

HUNTING FOR GLYCERINE?

Armour has it as close as your phone. Just call the nearest of Armour's 332 convenient stock points for all grades. Quick delivery keeps your inventories low.

ARMOUR *Glycerine Division*

Armour and Co., 1355 W. 31st St., Chicago 9, Ill.



Van Vlaanderen Nylon Heat Setting Machine in actual plant operation.

This is the new

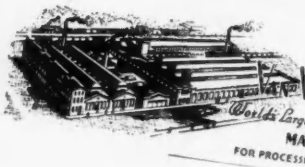
VAN VLAANDEREN NYLON HEAT SETTING MACHINE

IT'S DONE WITH BALANCED-FLOW, HEATED AIR. That makes the Van Vlaanderen Nylon Heat Setting Machine different—and, we believe, better.

CIRCULATED, HEATED AIR, permeating every fibre of the goods, uniformly and instantaneously effects setting—without any part of the machine or goods ever exceeding the setting temperature. This method results in better set fabrics; stable in dimensions, free from sagging, shrinking or stretching and having great resistance to wrinkling.

CIRCULATED, HEATED AIR permits simpler design and easier, more reliable control; less possibility of mechanical failure and (of great interest to the finisher) lower initial and operating costs.

CIRCULATED, HEATED AIR is, in our considered opinion, the most satisfactory of the various methods of heat treatment.



VLAANDEREN MACHINE COMPANY

World's Largest Manufacturers of MACHINERY FOR PROCESSING MODERN FABRICS

CABLE ADDRESS "VLAANDEREN PATERSONNJ"

TELEPHONE SHERWOOD 2-0800

370 STRAIGHT STREET

PATERSON 3, N.J., U.S.A.

An invitation to nylon dyers and finishers

Before buying a Nylon Heat Setting Machine you are invited to see this new and entirely different machine operate under actual plant conditions. Because there is only one source of heat and only one set of controls, operation is simple, direct, trouble-free and temperature can be held within close limits.

Waiting time is minimum when starting the machine. Setting temperature of fabric is effected almost instantaneously on entering machine.

There are many other advanced features designed into this machine. Why not see it yourself now? I will be glad to hear from you.

Cordially,

C. H. Van Vlaanderen

President

VAN VLAANDEREN MACHINE COMPANY

370 Straight Street, Paterson 3, New Jersey • Cable address: Vlaanderen, Patersonnj, U.S.A.

World's largest manufacturer of machines for processing modern fabrics

GIVE YOUR FABRICS

A HAND

A WIDELY ACCLAIMED

PERFORMER AMONG

CATIONIC FINISHING AGENTS

Where a soft, smooth "hand" is required, your selection of a cationic finishing agent is most important. DRUCOMINE A economically imparts the desired finish effect to fine fabrics, while assuring maximum preservation of light-fastness and safety to sensitive shades.

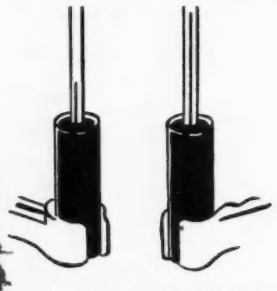
DRUCOMINE A can be employed successfully alone or in conjunction with synthetic resins. Samples and literature upon request.

E. F. DREW & CO., INC.

15 EAST 26th STREET · NEW YORK 10, N. Y.

FACTORY & LABORATORIES: BOONTON, NEW JERSEY

BRANCH OFFICES: CHICAGO • BOSTON • PHILADELPHIA • GREENVILLE, S. C. • MONTREAL, CANADA • RIO DE JANEIRO, BRAZIL • BUENOS AIRES, ARGENTINA



SPEEDIER APPLICATION in the wetting of textiles is achieved with DECERESOL Wetting Agents. Low surface tension of liquid containing DECERESOL OT is illustrated here by the capillary method. Tube on left contains a 0.01% solution of DECERESOL OT 100%, tube on right plain water.

Win both eye and hand approval with NO-ODOROL* finishing oils

Today the hand is often quicker than the eye in deciding a sale. For women are becoming increasingly finish conscious.

Cyanamid offers a full line of specialties that helps textile manufacturers achieve superior processing results. NO-ODOROL Finishing Oils, as an example, are extremely effective as softening agents for cotton, silk and rayon fabrics, and for hosiery and knitted fabrics. Grades are available for use on the finest fabrics as well as for heavy work clothing fabrics—priced to meet every requirement, with quality always maintained.

NO-ODOROL Finishing Oils are only one of a varied line of Cyanamid sulfonated oils and other textile specialties which include penetrants, softeners, finishes, sizing compounds, DECERESOL* Wetting Agents, PARAMUL* 115 Water Repellent and others. Our technical staff and research facilities are at your service in applying these products to your business.

Write for a copy of our booklet, "Textile Specialties".

*Reg. U. S. Pat. Off

WATER BORNE STAIN RESISTANCE PLUS water repellency can be imparted in one treatment with Cyanamid's PARAMUL 115, a semi-durable water repellent. Easy and economical to use, it is equally suitable for cotton, rayon, linen and wool.

AMERICAN Cyanamid COMPANY

INDUSTRIAL CHEMICALS DIVISION, DEPT. E11

30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.